IN THIS ISSUE—THE SHEATHING OF AIRPLANE PROPELLERS

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The AUTOMOBILE and Automotive Industries

Vol. XXXVII
No. 17

NEW YORK, OCTOBER 25, 1917

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Editorial Contents, page 3

Advertisers' Index—Next to last page

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The AUTOMOBILE and Automotive Industries

VOL. XXXVII NEW YORK—THURSDAY, OCTOBER 25, 1917—CHICAGO No. 17

Sheathing and Balancing Airplane Propellers

Methods Employed in Balancing Propellers—Object of Sheathing and Conditions Determining the Design of Sheath Protectors—Directions for Applying the Sheathing

By George B. Fuller

THE object of putting a sheet-metal tip or sheath on an airplane propeller is to protect the tip, face, and entering edge from wear and cutting, due to flying sand, dirt, etc., or from splintering when landing in tall weeds and grass; also, on seaplanes, to protect the tips from water spray, which is very damaging. Experience has shown that tips without the protection of a metal sheath sometimes split even under the most favorable conditions.

Balancing Propeller

Before the metal sheaths are attached the propeller must be tested for balance. For this the permanent hub should be fitted. After a hub has been fitted it should not be removed, because it is difficult to replace a hub without altering the balance or throwing it out of true. The propeller should be in balance for every position of the blades; that is, whether the blades are vertical, horizontal, or inclined. After the propeller is varnished and sheathed it must again be in perfect balance. Often a little varnish, properly placed, will be sufficient to bring the propeller into balance. Sometimes a small metal block is put on the hub of the propeller to balance it. This is bad practice. If the propeller is in balance before it is varnished and sheathed, and great care is exercised in cutting the sheaths to the same pattern, there will be no necessity for resorting to this crude method of balancing.

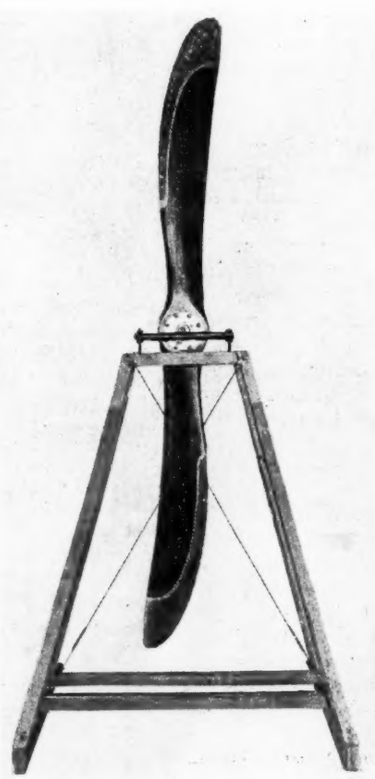


Fig. 1. Balancing stand for propeller

Fig. 1 shows a good stand for balancing at a flying field. Care must be taken that the balancing is in a small, closed room, so there will be no slight drafts to disturb the balancing. Care must also be taken to first have the balancing stand accurately leveled before balancing.

If a propeller is found to be greatly out of balance before sheathing it should be balanced by removing some of the wood, using templates to keep the proper section of the blades, thereby preserving the aerodynamic qualities of the propeller.

Shape of the Sheath

The exact shape of the sheath must be determined largely by experience, and is controlled by the condition of the flying field. If the airplanes are used on hard, smooth ground or close-cut grass, the sheath may be much smaller than when used on water, loose dirt, or on a sandy

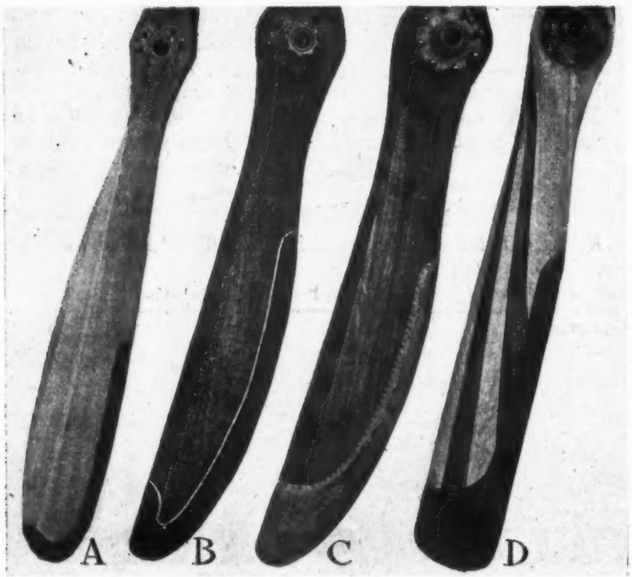


Fig. 2. Different styles of sheathing

flying field. Narrow sheaths similar to *A*, Fig. 2, for example, have not proved sufficient protection to the propeller blades when used on a loose-dirt flying field or on water.

Propeller sheath *B*, Fig. 2, is very satisfactory for a land machine used on a loose-dirt flying field.

Propeller sheaths *C* and *D* have also proved satisfactory for use under similar conditions, but are more especially suited for seaplanes.

The sheath should extend on the leading edge about 60 per cent of the radius from the tip toward the hub, and from 4 in. to 8 in. on the trailing edge. Two propellers sheathed similar to *B*, Fig. 2, extended only 50 per cent of the radius, and the propeller blades showed considerable wear above the tips. If these sheaths had extended 60 per cent of the radius they would have taken all the wear and have been a sufficient covering.

On the leading edge the sheath should be about 1½ in. wide near the hub, tapering to 1¾ in. or 2 in. wide at the tips and from 3 in. to 6 in. on both faces of the blade (see *B*, Fig. 2).

For a propeller blade with a broad, square tip, the sheath should be about the same width along the leading edge as for a narrow blade, but it will be necessary to extend the sheath about 6 to 10 in. from the tip on both faces of the blade, similar to sheath *D*, Fig. 2.

Small sheaths, similar to *A*, Fig. 2, which extend about 50 per cent of the radius, are very satisfactory, except for use on seaplanes or for airplanes used on loose-dirt flying fields.

Brass and Copper Sheaths

Soft sheet brass or half-hard sheet copper are best for making sheaths, because they are easy to work, and there is no difficulty in soldering the nail or rivet heads to them. The first is a little more difficult to work, but it resists wear a little better. At first, brass about 0.008 in. thick and copper 0.010 in. thick were used. These materials were too thin, and trouble was experienced because the metal wrinkled and bulged out like "blisters," and could not be made to hold close to the form of the blade.

The failure of these thin metal sheaths led to the adoption of heavier gage metal. Thus far, 10-oz. and 14-oz. copper have proved most satisfactory. One propeller fitted with 14-oz. brass (about 0.020 in. thick) was in use about a month when it was broken, so no definite information as to how long it would wear is available. However, no perceptible wear could be detected. At the same time another propeller was fitted with a 14-oz. copper sheath; it has been in service about four months, shows very little wear, and the metal holds its shape very well.

Cutting and Assembling Sheath

First cut the pattern by laying a piece of heavy paper on the face of the blade, and mark the outline of the blade on the paper. From this line lay off the width of the sheaths as described above, great care being taken to so shape the inner edge that it will not lie parallel to the grain of the wood in the propeller. The metal for the back of the blade should be cut from this pattern, but the metal for the face of the blade must be cut ¼ or 5/16 in. wider along the entering edge, tip and trailing edge to allow for folding over on the back for soldering.

Attach the back strip first, being careful to bring the outer edge of the sheath even with the edge of the blade, Fig. 3. Nail along the inner edge of the strip of the blade first, using No. 19 (0.042 in.) by ⅝ in. brass wire nails, spaced about ½ in. apart and about ⅛ in. from the edge, being careful to have the nails pass through different grain of the wood. Use brass wire nails in preference to steel wire nails, because solder holds better over the heads. Nails that come through should be clipped off 3/16 in. to ¼ in. long and then tightly clinched.

To make this strip conform to the blade it may be necessary to peen or hammer the sheath to shape.

Next attach the strip to the face of the blade, allowing the extra width provided for the seam to project beyond the edge of the blade for turning over. Nail the inner edge of the strip to the blade in the same manner as for the other strip, using the same kind of nails, spacing them the same distance apart, and having each nail pass through different grain of the wood. In driving the nails through from the face of the blade, care must be taken to make them pass through the metal on the back of the blade. Cut off and clinch as before.

Copper Rivets Best

To make the sheath conform closely to the shape of the blade and to resist the action of forces of the sheath due to acceleration, aerodynamic, centrifugal and gyroscopic action, rivets must be used. The spacing of the rivets will be determined after determining the magnitude of these forces. Holes should be drilled through the sheath and blades which will allow a close fit to the rivet. Do not drive rivets without first drilling for them. In riveting the head care should be taken not to bend or distort the rivet. Brass rivets about 1/16 to 5/64 in. diameter will be found quite satisfactory. Brass escutcheon pins can be used to good advantage, but copper rivets with a large diameter thin head will be most satisfactory.

The projecting edge of the metal *A*, Fig. 3, on the face of the blade should now be carefully folded over and made to conform closely to the contour of the blade, as shown by the dotted line. Solder this seam and solder over each nail head, clinched end of nails, and over the rivet heads; then remove all superfluous solder with a file.

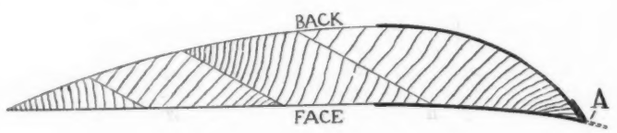


Fig. 3. How sheath should be fitted

Drill three or four small holes, 3/32 to ⅛ in. diameter, through the metal at the back of the blade and at the extreme tip, or through the extreme tip radially toward the hub. This is to allow any moisture that may collect to be thrown out.

Large Force Acts on Sheath

Generally in the design of an airplane propeller, the acceleration, centrifugal and gyroscopic forces due to the weight of the sheaths, and the aerodynamic force are not taken into consideration. It is interesting to note the high velocity of the tips of a propeller and to see the magnitude of the forces. The velocity of the tips of a propeller of 8 ft. 4 in. diameter at 1400 r.p.m. is 6.94 miles per minute or 610.85 ft. per second.

When a propeller is revolving in one plane (that is, when the airplane is flying in a straight course) there are three forces acting upon the sheath, viz: accelerating, aerodynamic and centrifugal forces. The first is so small that it can be neglected, since when the propeller has nearly attained its maximum velocity the acceleration is small and rapidly diminishing. The second and third are much larger and should be considered in the design of the propeller to insure a proper safety factor.

Centrifugal Force

The centrifugal force on 1 sq. in. of 14-oz. copper sheathing at a radius of 50 in. (the tip of an 8-ft. 4-in. propeller) revolving at 1400 r.p.m. is 16.92 lb., and is determined as follows:

$$\text{Centrifugal force} = \frac{WV^2}{gr} = 0.000314\ Wrn^2$$

W = weight = 0.006076 lb.
r = radius in feet = 4.166 ft.
V = velocity in feet per second.
g = acceleration due to gravity = 32.17.
n = r.p.m. = 1400.

The aerodynamic force on the propeller sheath is the pressure on the face of blade which tends to hold the sheath to the blade, and a suction on the back of the blade which tends to lift the sheath off the blade. The pressure on the face can be neglected, but the suction force on the back is much larger and should be considered in designing and assembling the sheath.

For a section similar to the *RAF*6 wing section at a radius of 50 in. and at 1400 r.p.m. the maximum suction is 1.92 lb., and is determined as follows:

$$\text{Air force per sq. in.} = \frac{KVA^2}{144}$$

K = coefficient for the section = 0.00159* lb. per sq. ft.
A = area in sq. in. = 1.
V = velocity in miles per hour = 416.49.

Gyroscopic Force

The gyroscopic force is caused by the airplane making turns; that is, making the propeller change its plane of rotation. By making a steep bank an airplane can make a complete turn in 25 seconds. A complete turn in 20 seconds has been recorded.

The gyroscopic force on 1 sq. in. of 14-oz. copper at a 50-in. radius at 1400 r.p.m. and the airplane making a complete turn in 25 seconds is 0.97 lb., and is determined as follows:

Gyroscopic force = $mrOo$ †
m = mass = 0.006076 lb.
r = radius in feet = 4.166 ft.
O = angular velocity of the propeller in radians per second about its axis or shaft.
o = angular velocity of the airplane in radians per second in making a steep bank.

The forces on the sheath thus determined for the different radii of the sheath furnish a basis for determining the size and spacing of the rivets.

The forces vary directly as the radius, hence after determining these forces for one radius all the other forces are directly proportional. There will be a slight error in the aerodynamic force due to the changing of the propeller sections and the varying distances from the tip of the propeller, but this error will be very small.

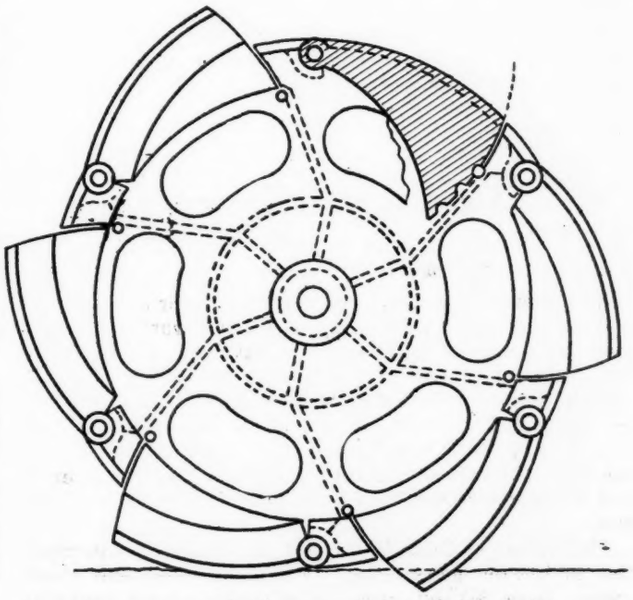
*British Advisory Report 1912-13.
†Dr. Zahm's article in *Aerial Age Weekly*.

Adjustable Grip Tractor Wheel

A NOVEL kind of tractor wheel which can be adjusted either to have a smooth tread or to provide any desired degree of grip has been designed by W. E. Wild, Gardena, Cal. It is almost fully explained by the illustration.

The body of the wheel is designed with opposite, circular plates which lie parallel to each other and are formed integral with a hub, which hub may be of any design for the reception of particular makes of anti-friction bearings. A cross web is formed between the side plates to more thoroughly reinforce the structure. In order to lighten the wheel a series of openings are formed throughout the circumference of each of the plates. These openings occur between radial webs which form compartments within which the flanges of the adjustable tread members are positioned. Fixed tread plates are formed at the outer ends of the radial webs and arranged in circumferential length for the reception of the adjustable tread members.

The adjustable tread plates are of a length adapted to permit them to fit between the adjacent ends of the fixed tread plates and to pivotally swing outwardly from circumferential alignment therewith upon pivot pins. A boss is formed beneath the tread plate and is adapted to register with the openings in the side flanges in a manner to secure the tread member against lateral movement. Formed integral with each of the tread plates, and extending inwardly therefrom, is a "flight" plate which is arc shaped and is formed concentric with the pivot pin. The tread plates may be adjusted to expose various lengths of the flight plate.



Tractor wheel designed to give any degree of grip

President Wilson Inspects War Trucks

Secretary of War Newton D. Baker Thanks Engineers for Speedy Work—Trucks Formally Accepted by War Department

WASHINGTON, D. C., Oct. 19—The first two heavy-duty war trucks designed by the Quartermaster Department of the Army, assisted by the Automotive Products Section of the Council of National Defense and the Society of Automotive Engineers, were officially delivered to and accepted by the Secretary of War, Newton D. Baker, to-day in the presence of many important officials.

Secretary Baker, following the acceptance of the trucks, stepped into the driver's compartment and drove the truck himself from the grounds behind the State, War and Navy Building out into the street and around the grounds.

President Wilson and members of his Cabinet viewed the trucks later in the day when they were driven to the White House park. The President and all officials were outspoken in their admiration for the new engineering success and remarked at length about its importance to the national cause.

H. L. Horning, chairman of the Automotive Products Section of the War Industries Board, discussed the truck at length with President Wilson, who was particularly interested in the short schedule allowed for the design and production of the first truck and in the remarkable record which even beat the scheduled time. The President also was interested to learn that the trucks can operate efficiently on inferior grades of fuel if the necessity arises. He expressed great satisfaction at the promptness with which many manufacturers of the parts responded.

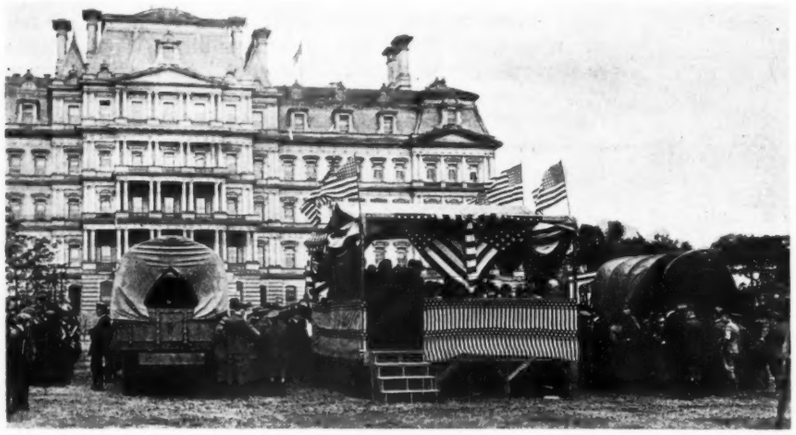
A. W. Copland, discussing the trucks at the presentation ceremonies, said: "Mr. Secretary and gentlemen and General Chauncey B. Baker, representing the engineers who designed the standardized Class B heavy-duty war truck under the direction of your officers and the manufacturers who collaborated in building the two sample trucks which we have here, I have the honor to turn over to you these two sample trucks, which are the first fruits of our labors.

"We promised you to design the Class B heavy-duty war trucks and build two samples by Oct. 10. These two sample trucks were completed 2 days ahead of the schedule, one being built in Rochester, N. Y., and the other in Lima, Ohio. For road test they were driven under their own power over the mountains to Washington.

"The engineering work is now finished and the Class B heavy-duty war truck is ready for quantity production."

General Chauncey B. Baker, accepting the trucks from Mr. Copland, expressed gratitude and appreciation to all of the engineers, and said:

"Mr. Copland, members of the Schedule Committee and of the Society of Automotive Engineers, all of whom have done so much in putting into these trucks your energy, your time and the children of your brains, we can only say we thank you. I shall take the privilege of asking the Secretary of War to ex-



Official reception at War, State and Navy Building

Left—Major W. G. Wall shows the truck to French and British officers. Right—President Wilson studies the engine

press to you the gratitude that the Army and the Nation will have in knowing the results of your efforts."

To which Secretary of War Newton D. Baker replied: "General Baker, ladies and gentlemen, there are some very significant things about this moment. We are assembled here to see the fruits, the embodied fruits, of the application of American ingenuity and patriotism in the service of a great national cause.

"It used to be the custom in ancient times in war to bring back, for the delight of the home people, long troops of captives and much enemy spoil. I take a very high delight in feeling that one of the by-products of this national effort on our part replaces the ancient captive train with fresh and serviceable achievements of science, ingenuity and American skill, and I look upon these trucks as trophies which despoil nobody else, but which enrich America.

"It is, of course, true of modern war that it is a scientific combat. In the very highest sense of the word all of the advances of modern science are being called into service in order to enable us to attain superiority over our adversaries. In America we have seen many stimulating evidences of the willingness and enthusiasm with which our people are co-operating in our preparation, but I know of none more significant than the two mechanical triumphs which have been worked out in the production of the Liberty motor for the airplane service and the production of the standardized truck for army transport. The enormous economy of this simple machine, with its interchangeability of parts, its facility of dispersed manufacture, is so great that I have no doubt that both our own army and those associated with us will regard this as one of America's substantial contributions to the war.

"I want to say to those who have been engaged in this work that while their occupation seemed somewhat less spectacular, perhaps, than the uniformed military activity of the soldier in the battlefield, it is in no sense a less significant contribution to the advancement of our national cause. Therefore, on behalf of the Government, and notably on behalf of the War Department, I express to all those who have been instrumental in bringing this great thing to pass our very grateful and hearty appreciation, and I extend to them also the compliments of the Government upon the speed and certainty with which they have done their task and the fine success which has attended their efforts.

"I have just been told, as you have, that one of these trucks was manufactured in the city of Lima, Ohio. That is not very far from my home. I trust it will not be regarded as an unfit thing that I ask those who are in charge of these engines to permit me, as an Ohioan, to have the great privilege of driving the Lima truck just a short distance to show how quickly an unaccustomed person can be taught to use these simple instruments."

Officials Present

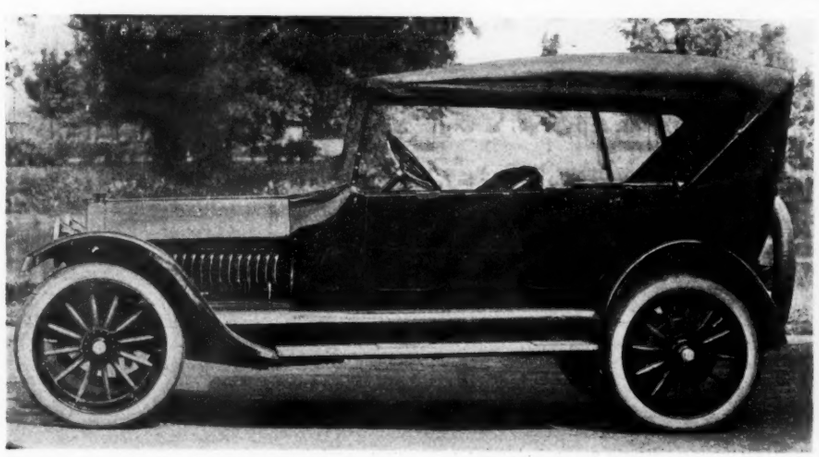
Others included among the prominent officials present were Postmaster General A. S. Burleson, Secretary of the Navy Josephus Daniels, Christian Girl, chairman of the Military Truck Production Board, and his staff; Howard E. Coffin, Council of National Defense; Walter S. Gifford, Director of the Council of National Defense; Everett L. Crawford, Percy R. Pyne, 2nd, and Preston Davie of the Council of National Defense; Col. E. A. Deeds of the Aircraft Production Board; Major B. D. Gray, Captain A. J. Slade and Charles Bush of the Signal Corps; Thomas A. Edison, Peter Cooper Hewitt, Gen. McLaughlin, British Attache; Major W. G. Wall of the Ordnance Department, and F. A. Scott, chairman and R. S. Brookings of the War Industries Board; C. W. Stiger of the Automotive Products Section; W. B. Stout of the Aircraft Production Board; Major H. A. Hegeman and staff; F. G. Diffen, chairman of the International Aircraft Standards Board; Alfred Reeves of the National Automobile Chamber of Commerce, and Coker F. Clarkson, general manager of the Society of Automotive Engineers.

New Series Five-Passenger Studebakers

THE 1918 Studebaker five-passenger cars are mounted on the same chassis as previous models and both the four and six are interchangeable. Body lines remain the same generally, but changes in the front seat and spring suspension give the impression of a longer, lower car.

There is a change in the seating arrangement of the five-passenger as compared with the seven-passenger Studebaker. Instead of individual front seats there is a straight seat placed lower than the individual seats of the seven-passenger. The elimination of the auxiliary seats permits the use of a new limousine type foot rest, which is made of wood and covered with the same material as that used for the tonneau carpet.

An adjustable tilting steering wheel supersedes the plain wheel of former models and there is now a slanting windshield. Linoleum covered, metal bound running boards replace the corrugated aluminum running boards of the preceding models. Safety step plates are placed at the entrance of the tonneau doors.



The wheels and rims are the same as on the De Luxe models carrying tires 35 by 4½ in. About one-third of the output will come through with natural finished spokes, the balance in black. There are two options in body color for both the four and six Packard—red and deep blue. Changes in the chassis include lighter rear springs placed lower on the axle. Instead of the plain glass lens in the headlamps, a deflecting type is used. The top is of imitation leather, with drab lining. Rear windows are plate glass, nickel trim. Gypsy curtains are fitted also. The price of the four is $1,050, and that of the six $1,350, f.o.b. Detroit.

Case Two Plow Tractor

Has Four Cylinder Block Engine with Valves in Head—Transmission Gearing Is Completely Inclosed and Rear Axle Mounted on Roller Bearings

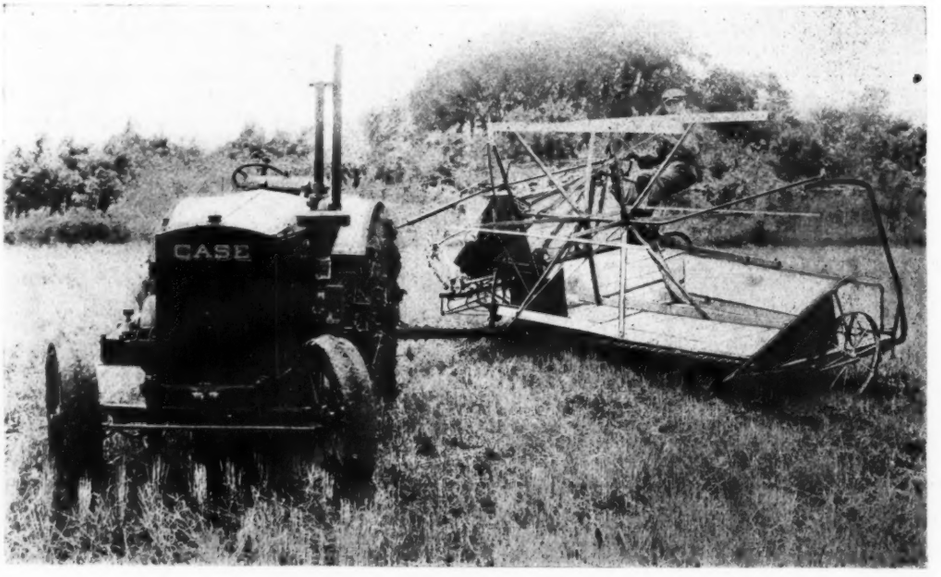
A close view of the Case 9-18 Tractor

ONE of the most extensive lines of farm tractors produced by a single firm is that of the J. I. Case T. M. Co., Racine, Wis. It includes both steam and internal condition tractors, all of the latter being operated on kerosene. The kerosene tractors are produced in five different sizes of the following ratings: 9-18, 10-20, 20-40 and 30-60 hp. In the present article it is proposed to deal with the "baby" of the line, the 9-18 model, which is the most recent addition and already has achieved a considerable measure of popularity. It is adapted to hauling two 14-in. bottoms and operating a 20-in. cylinder thresher without feeder or windstacker. The tractor complete weighs 3650 lb. and sells at $950.

The engine is of the four-cylinder block type with valves in head. It has a bore of 3⅞ in. and a stroke of 5 in. The cylinder block is cast integral with the top half of the crankcase, but the cylinder heads are separate and are secured to the cylinder casting by means of studs and nuts. An interesting feature of the cylinder design is that the cooling jacket extends all the way down the cylinder walls. There are two large hand hole plates at one side of the casting. These facilitate the removal of core sand and also make the cylinder less susceptible to damage by frost. The valves are arranged in a line across the cylinder heads and are operated from a single camshaft through the intermediary of rock levers bearing on the cams, tappet rods and tappet levers. Valve adjustment is provided for at the upper end of the tappet rods, where the rods screw into yokes that connect with the tappet levers. The inlet manifold is cast in the cylinder head, and there is only a short, elbow-shaped inlet pipe between the carbureter and the inlet port in the cylinder head. The whole valve mechanism is inclosed by a sheet metal cover which rests on a ledge cast on the cylinder head and is held in position by means of two nuts with scalloped rims to give a good grip. The valve chamber on top of the cylinders is in communication with the crank chamber through the vertical passage through which the tappet rods rise, and sufficient oil from the spray in the crank chamber gets up into the valve chamber to insure efficient lubrication. The bearings for the crankshaft are carried by the lower half of the crankcase and are provided with the usual bearing caps, shims being placed between the caps and the bearings proper for purposes of adjustment. There are also two hand hole openings in the upper half of the case, the covers of which are provided with packing and are clamped down by means of yokes in such a manner that they can be quickly removed. When adjustment of the crankshaft bearings becomes necessary it can be made through these hand holes. Both the main and the crankpin bearings are of the shell type, consisting of steel shells filled with babbitt.

The crankshaft is of the two-bearing type and is made from a drop forging which is heat treated. The bearings are accurately ground to size and the shafts are balanced. Drop forged I-section connecting rods are used. The crankpin end of the rod has the steel backed babbitt bearing already referred to, while the upper end is fitted with a solid bronze bushing. The pistons are made of gray iron, ground to size and provided with three packing rings at the upper end. Oil grooves are cut on the lower part of the piston skirt. A feature in connection with the crankpin bearings is that the bolts are inserted from below and the nuts are on top, so that adjustments can easily be made through the hand holes in the top half of the crankcase.

Underneath the lower part of the crankcase is a sheet metal oil sump in which the oil supply is carried. There are oil troughs under each connecting rod head, and these heads are cast with dippers or splashers, which, as the



Hauling a self-binder with auto hitch

crank revolves, splash the oil around in the case. A plunger pump operated by means of an eccentric on the camshaft is set into the lower half of the crankcase and extends practically to the bottom of the oil sump, where its inlet is surrounded by a gauze strainer. The pump has two ball check valves, one located at the bottom of the pump barrel and the other inside the hollow plunger. From the pump the oil flows through an outside tube to an indicator located in direct view of the operator, and thence it passes into the engine again through a distributing pipe which has leads running to the main bearings and to the splash troughs. An oil level indicator of the float type is provided, the stem projecting from the crankcase near the cylinder wall and being provided with a ball on top. The oil filler for the crankcase extends about half way up the side of the cylinder block and is very accessible.

Fuel is carried in a cylindrical tank directly back of the engine, whence it is conducted to the carbureter located on the forward side of the engine. A supply of hot air is obtained from an air heater on the exhaust manifold. There are two throttle valves in the inlet passage between the carbureter and the engine, one of these being connected to the governor and the other to the hand throttle lever. The governor is of the fly ball type, and is entirely inclosed within the cam gear housing at the forward end of the engine. By means of a small cover plate access may be gained to the governor. The wearing surfaces of the latter are case hardened.

Ignition is accomplished by means of a high tension magneto which is fitted with an impulse starter to facilitate cranking. No battery is carried. The magneto, water circulating pump and fan are driven from a secondary shaft running parallel with the camshaft at crankshaft speed.

The whole engine is set crosswise of the frame, which has the advantage that it does away with the need for bevel gears or other transmission devices capable of transmitting power between shafts at right angles to each other. But as the radiator is set in the usual position at the front of the frame it necessitates a right-angled drive to the fan. This drive is obtained from a pair of helical gears which are completely inclosed. The fan shaft is mounted on ball bearings, and as the drive of the fan is entirely through gears, a friction clutch is provided which permits the fan to slip in case the engine is suddenly retarded or accelerated. The construction is clearly shown in one of the illustrations herewith.

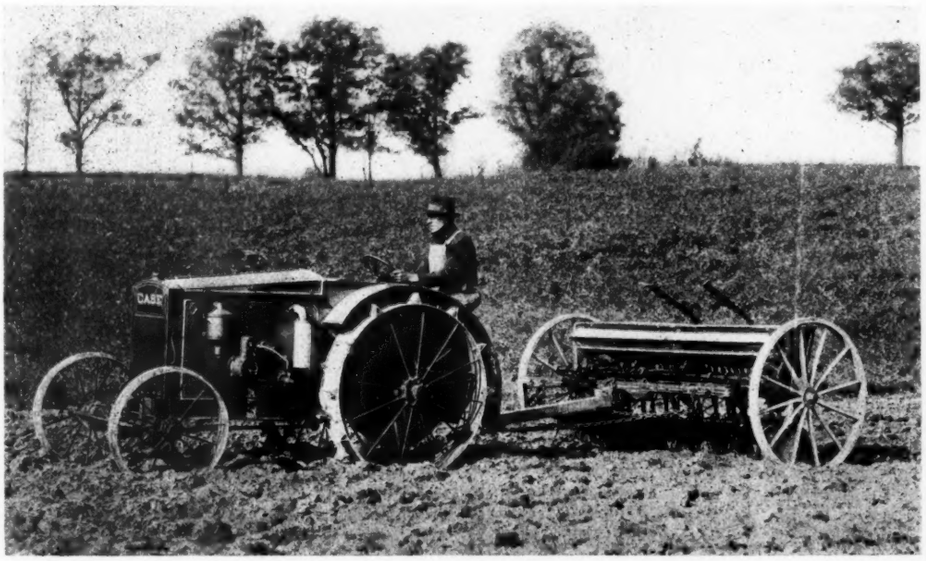
A truck type radiator is fitted and the cooling water is circulated by means of a centrifugal pump. As the pump is on the forward side of the engine and as there is but one water inlet to and one outlet from the jacket, the cooling connections are quite simple.

Tractor with extension lugs hauling a grass mower

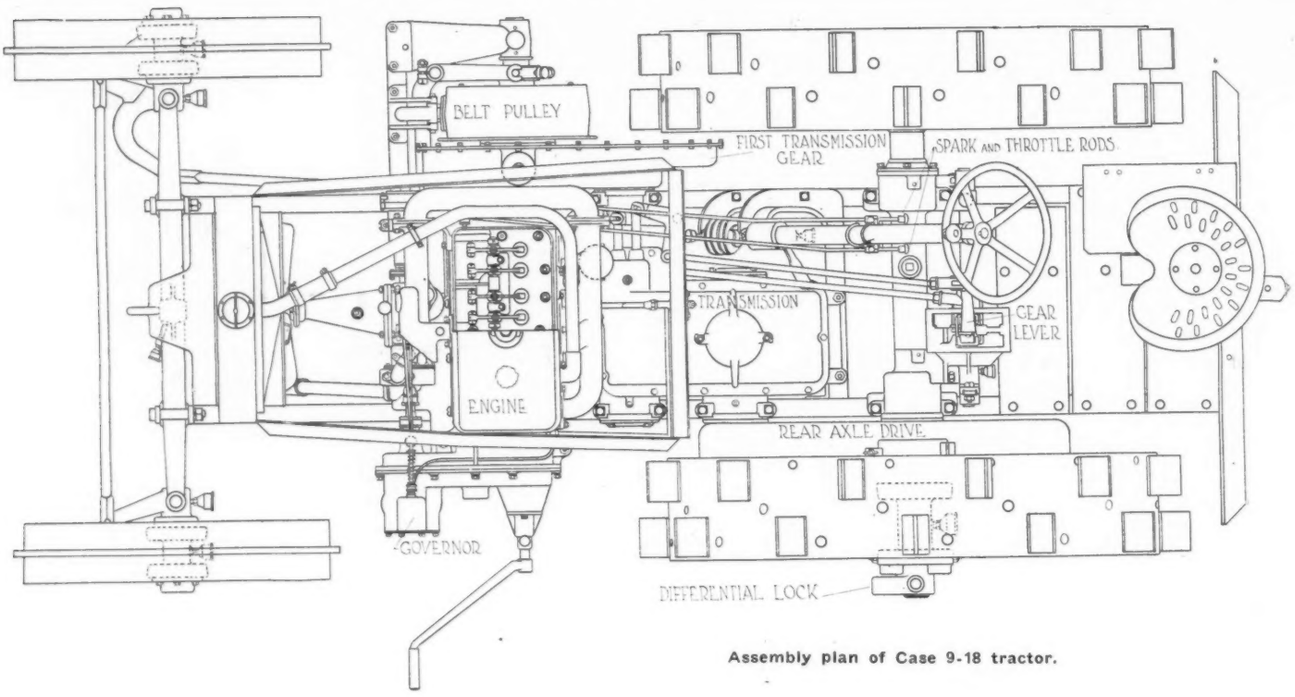
The clutch is of the expanding, toggle-operated type and has shoes faced with Non-burn asbestos clutch lining. It is operated by means of a hand lever from the driver's seat. The parts by means of which the clutch is adjusted are very accessible. The same clutch serves both for transmitting power to the driving axle and for operating machinery through the belt pulley. A brake is also provided on this pulley and is operated by moving the clutch lever the opposite way. By means of this brake driven machinery can be quickly brought to a stop, and when the transmission gears are in mesh the brake can be used as a road brake for stopping the tractor on steep grades.

The 9-18 Case tractor is designed for all kinds of farm work and is provided with a belt pulley 14 in. in diameter by 5 in. face. This pulley is mounted free on an extension of the engine crankshaft, to which it can be locked by means of the friction clutch. There is an outward bearing on the extension of the crankshaft, the bearing bracket for same being bolted to an extension of frame cross member. This pulley is in a very accessible position outside the first transmission case, so the belt can be easily put on and taken off, and there is a flange on the inside of the pulley so that the belt will not come in contact with the gear housing.

A driving pinion is keyed to the hub of the belt pulley and meshes with the large gear wheel on the end of the fluted shaft of the transmission. This pinion and gear are known as the first transmission gearset and are inclosed in a housing made up of a casting and a sheet metal cover plate. The transmission proper affords two forward speeds and a reverse and is of the selective sliding pinion type, the sliding pinions being mounted on a fluted shaft. Both shafts of the transmission are mounted in Hyatt roller bearings. The secondary shaft of the transmission extends from the housing and carries the bull pinion, which meshes with the bull ring on the rear axle. This latter is fitted directly over the differential gear located between the frame and the left-hand driving wheel. All gears in the transmission, including the bull pinion, are made of steel, have the teeth machine cut and are hardened. The bull ring is made of semi-steel and has its steel cast in a chill.



Seeding. Note the air cleaner and muffler outside the bonnet



Assembly plan of Case 9-18 tractor.

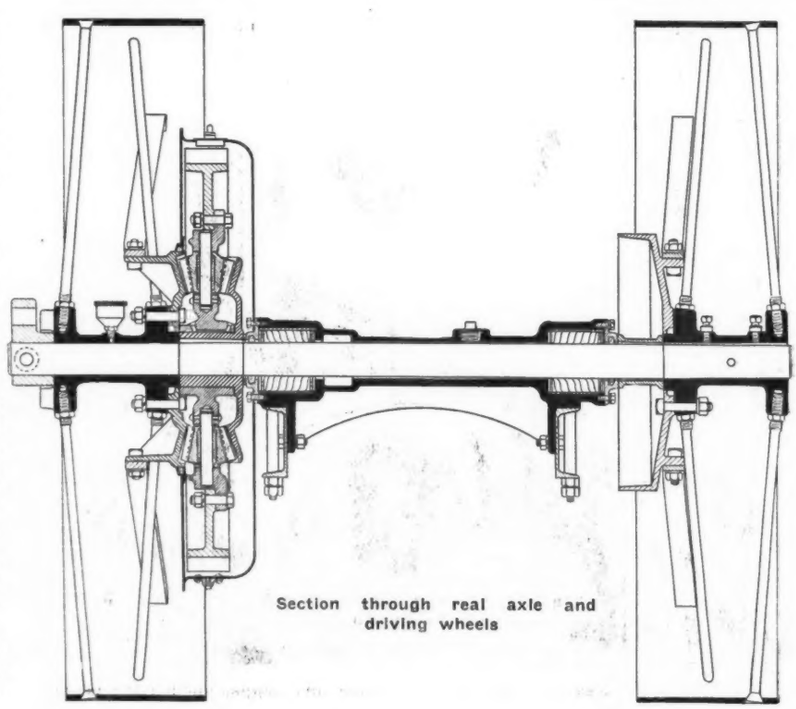
The two speeds of the tractor are 2¼ and 3½ m.p.h. respectively. Every part of the transmission is inclosed in a dustproof housing and can be effectively lubricated.

The rear axle is a live axle design and—what is rather unusual—is fitted with anti-friction (Hyatt flexible roller) bearings. The axle shaft extends without break through the axle housing and both wheels. One of the driving wheels is keyed and pinned to the axle, while the other driving wheel is free upon the axle, but has one side gear of the differential flange-bolted to it. The whole driving gear on the rear axle is inclosed in a sheet metal housing which is secured by cap screws to the end of the axle housing and has a packed joint with the circumference of the differential side gear, the teeth of which do not extend entirely out to the circumference. In order to prevent loss of traction when one driving wheel stands on slippery ground a differential lock is provided. This consists of a bracket secured to the end of the rear axle shaft protruding from the free wheel. This bracket has a hole drilled through it, and a bolt can be inserted to engage with lugs on the wheel hub. The wheel rims are drilled for driving lugs so that different types of lugs may be used to suit the conditions of the work.

The frame of this tractor, which is made of 5-in. channel steel, is underslung from the rear axle. Flanges are formed on the axle housing to which the channels are fastened by bolts, in addition to which long bolts pass through the channels vertically and through lugs cast on the axle housing. The wheels are 48 in. in diameter and 10 in. wide and have steel spokes, with flat heads set into corresponding holes in the rim, and threaded inner ends screwed into hub flanges and secured by lock nuts. The threaded ends are upset, so as not to reduce the strength of the spoke below that of the unthreaded section. A brake drum is secured to the right-hand driving wheel, being piloted on the hub, bolted to same and also connected by driving strips to the wheel rim, the same as the differential side gear on the other wheel.

The frame side channels have the cross members riveted to them, as well as the steel castings which support the pin on which the front axle is pivoted. Owing to the provision of this swivel support for the front end of the frame the running gear is absolutely flexible and will accommodate itself to any surface. The housing of the transmission gears bolts directly to the side channels by bolts through reamed holes. The drawbar is so located that it pulls directly underneath the axle cannon bearing at a point below the rear axle, and is so constructed that it can be locked or left to swing, whichever is most desirable for the work in hand. A front axle of the automobile type is used, with yoked steering heads, both the axle and the steering knuckles being steel drop forgings.

Some observations on the performance of this tractor were made for the Case company at the Fremont, Neb., demonstration by Prof. L. W. Chase of the University of Nebraska.



Section through real axle and driving wheels

The tractor plowed an acre of ground 6 in. deep in 1 hr. and 16 4/5 min. at a fuel cost of 16 cents per acre. This demonstration was made with a three-bottom 14-in. plow and served merely to show the reserve power of the tractor, which is invariably referred to as a two-plow tractor.

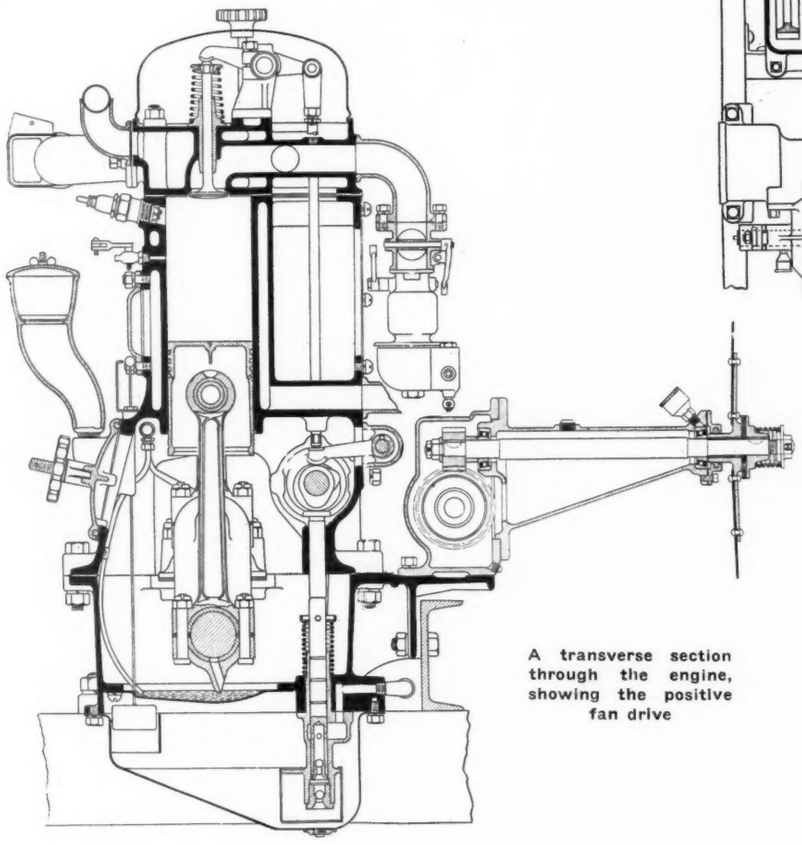
Pulling an 8-ft. double-action engine disc harrow, this same tractor covered one acre in 22 4/5 min., at a fuel cost of 9 cents, burning kerosene. Pulling a 20-ft. four-section spike-tooth harrow, the tractor harrowed an acre in the average time of 9 4/5 min. at a fuel cost of 7 cents per acre.

In another test the tractor pulled a 16 single disc grain drill and seeded an acre in 18 min. at a fuel cost of 5½ cents per acre.

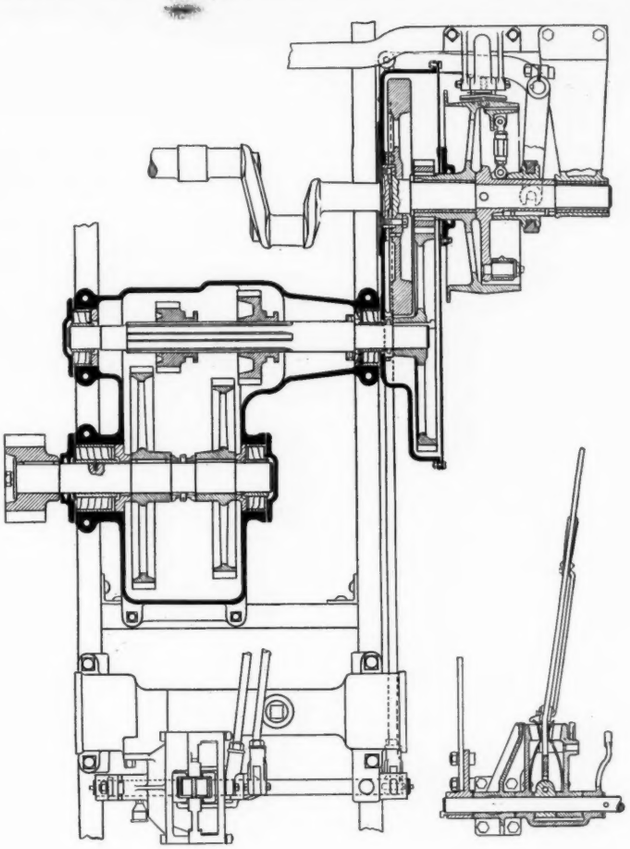
In addition to the tractor above described the J. I. Case T. M. Co. makes four other sizes of the following weights and list prices: (We understand, however, that prices are shortly to be materially increased.)

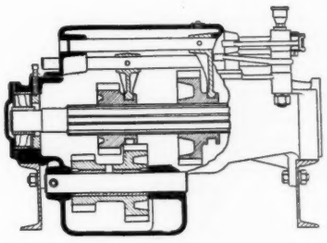
10-20 hp.	5,050 lb.	$1,075
12-25 hp.	9,000 lb.	1,650
20-40 hp.	14,050 lb.	2,450
30-60 hp.	25,800 lb.	3,000

All tractors operate on kerosene, though they have to be started on gasoline.



A transverse section through the engine, showing the positive fan drive





Section through clutch, first reduction gear and two-speed-and-reverse transmission; also details of gearshift mechanism and transmission support

Brass Nuts for Flange Studs

FOR exhaust manifold flange studs, for connections in the exhaust pipe, and even for muffler parts, steel nuts ought not to be used, except where cost is considered above everything else. It is usually easy to make bolts exposed to exhaust heat of such size that nuts of a softer metal than steel can be used safely. Good hard brass is excellent for the purpose. It is not injured by heat, and however much the studs may rust the nut will always come loose without moving the stud. In cases where the studs have to be of small diameter the nuts may be made of extra depth. One and a half times the bolt diameter is a good thickness for such nuts. It is a mistake to have brass nuts too small in outside diameter, as they are less likely to be injured with the wrench as their diameter grows bigger.

Duesenberg Marine Motors

A NEW catalog of its marine motors has been issued by the Duesenberg Motors Co., which is quite an artistic volume. Engines of several types are illustrated and described fully, and a large part of the catalog is given over to pictures of boats with Duesenberg equipment.

"Don't Waste Gasoline" Campaign Is Started

N. A. C. C. and Other Organizations Launch Big Movement—959,000 Gal. Needed Daily for War Work—Possible Daily Saving 1,500,000 Gal.—4,800,000 Gal. Used by Motor Vehicles and Boats

NEW YORK, Oct. 23—The National Automobile Chamber of Commerce has fired the first gun in a nationally organized "Don't Waste Gasoline" campaign. Allied with the N. A. C. C. is the American Automobile Association, the Motor and Accessory Manufacturers and the Society of Automotive Engineers. Van H. Manning, chief of the Petroleum Division of the United States Bureau of Mines, is directly co-operating in the campaign.

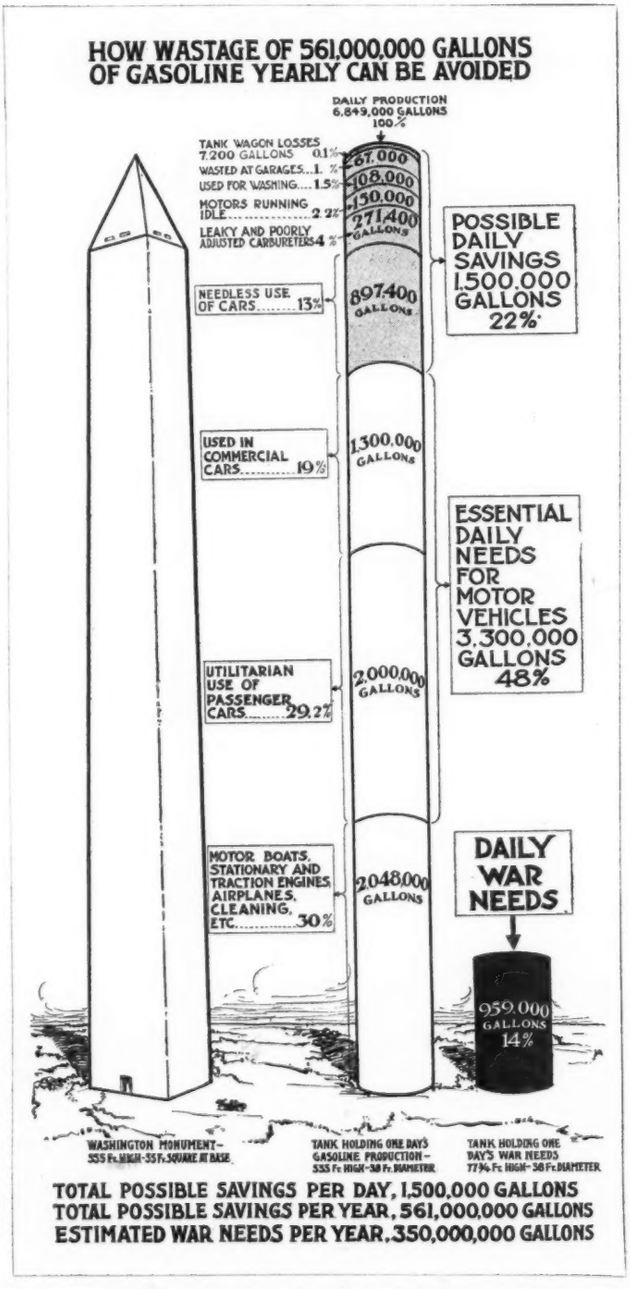
"The one certain way to insure a sufficient supply of fuel for war needs," says General Manager Reeves, of the N. A. C. C., "is to eliminate waste." All authorities agree that there is an ample supply of crude oil for all needs if wastage is avoided. It is estimated that the war needs of the country for army, navy and aviation branches will be 959,000 gal. of gasoline a day. The total daily gasoline production is 6,849,000 gal. Of this approximately 4,800,000 gal. are used by automobiles and trucks and the balance by motor boats, stationary engines and in other industries. The Bureau of Mines estimates that the following savings can be effected daily:

	Gal.
Tank wagon losses	7,200
Leaky carbureters	31,400
Poorly adjusted carbureters	240,000
Motors running idle	150,000
Wasted in garages	67,000
Saved by using kerosene in garages	108,000
Needless passenger mileage	897,400
Total	1,500,000

This total means a saving of 561,000,000 gal. a year, whereas our war needs are but 350,000,000 gal. a year, or less than two-thirds of what may be considered as wasted at present.

The N. A. C. C. co-operating with the government is preparing thousands of posters to be hung in salesrooms, garages and supply stations throughout the country. These give 15 ways in which gasoline can be saved.

1. Store gasoline in underground steel tanks. Use wheeled steel tanks with measuring pump and hose. They prevent loss by fire, evaporation and spilling.
2. Don't spill or expose gasoline to air—it evaporates rapidly and is dangerous.
3. Don't use gasoline for cleaning and washing—use kerosene or other materials to cut grease.
4. Stop all gasoline leakages. Form habit of shutting off gas at tank or feed pipe.
5. Adjust brake bands so they do not drag. See that all bearings run freely.
6. Don't let engine run when car is standing. It is good for starter battery to be used frequently.
7. Have carbureters adjusted at service stations of carbureter or automobile companies—they will make ordinary adjustments without charge.
8. Keep needle valve clean and adjust carbureter (while engine is hot) to use as lean mixture as possible. A rich mixture fouls the engine and is wasteful.
9. Pre-heat air entering carbureter and keep radiator covered in cold weather—this will insure better vaporization.
10. See that spark is timed correctly with engine and drive with spark fully advanced—a late spark increases gas consumption.
11. Have a hot spark, keep plugs clean and spark points properly adjusted.
12. Avoid high speed. The average car is most economical at 15 to 25 miles an hour.
13. Don't accelerate and stop quickly—it wastes gas and wears out tires. Stop engine and coast long hills.
14. Cut down aimless and needless use of cars. Do a number of errands in one trip.
15. Know your mileage per gallon. Fill tank full and divide odometer mileage by gallons consumed.


HOW WASTAGE OF 561,000,000 GALLONS OF GASOLINE YEARLY CAN BE AVOIDED
DAILY PRODUCTION 6,849,000 GALLONS 100%
TANK WAGON LOSSES 7,200 GALLONS 0.1%
WASTED AT GARAGES...1. %
USED FOR WASHING....1.5%
MOTORS RUNNING IDLE....2.2%
LEAKY AND POORLY ADJUSTED CARBURETERS 4 %
67,000
108,000
150,000
271,400 GALLONS
POSSIBLE DAILY SAVINGS 1,500,000 GALLONS 22%
NEEDLESS USE OF CARS....13%
897,400 GALLONS
USED IN COMMERCIAL CARS....19%
1,300,000 GALLONS
ESSENTIAL DAILY NEEDS FOR MOTOR VEHICLES 3,300,000 GALLONS 48%
UTILITARIAN USE OF PASSENGER CARS....29.2%
2,000,000 GALLONS
MOTOR BOATS, STATIONARY AND TRACTION ENGINES, AIRPLANES, CLEANING, ETC....30%
2,048,000 GALLONS
DAILY WAR NEEDS
959,000 GALLONS 14%
WASHINGTON MONUMENT—555 Ft. HIGH-55 Ft. SQUARE AT BASE
TANK HOLDING ONE DAY'S GASOLINE PRODUCTION—555 Ft. HIGH-38 Ft. DIAMETER
TANK HOLDING ONE DAY'S WAR NEEDS 77¾ Ft. HIGH-38 Ft. DIAMETER
TOTAL POSSIBLE SAVINGS PER DAY, 1,500,000 GALLONS
TOTAL POSSIBLE SAVINGS PER YEAR, 561,000,000 GALLONS
ESTIMATED WAR NEEDS PER YEAR, 350,000,000 GALLONS

The National Automobile Chamber of Commerce has prepared this striking illustration showing how small a percentage saving of gasoline will supply the needs of war. This picture is being issued for exhibition all over the country

Gasoline Shortage in South Africa

Automobile Trade Hindered—Big Need for Motor Vehicles — High Freight Rates Double Prices — No Shipping Facilities Provided for Automobiles and Motorcycles

PORT ELIZABETH, SOUTH AFRICA, AUG. 21.—It would seem that at the present moment the point most to impress on the motor people of America is that the gasoline companies, by the methods they are adopting, are absolutely handicapping the motor trade in all its branches. While on the one hand they assure people there is plenty of gasoline in the country and no necessity for private hoarding, on the other hand they cut down supplies to the trade to such an extent that there is nothing like sufficient gasoline to meet the average requirements of the every-day motorist. The position at present is an anomalous one. Either gasoline is really short, in which case people ought to be told the facts; or, if not, gasoline distribution should be carried out through trade channels. Indirectly I am in touch with large numbers of country motorists who come down to Port Elizabeth, and they one and all report the same state of affairs—that they cannot obtain sufficient gasoline from their usual suppliers to keep them going, and that in consequence almost every up-country car owner is very much restricted in the mileage he is enabled to do. This has led to quite a large number of cars being more or less permanently laid up.

With regard to the sale of new automobiles, there are so few coming through at present that the demand is still sufficient to take up these supplies.

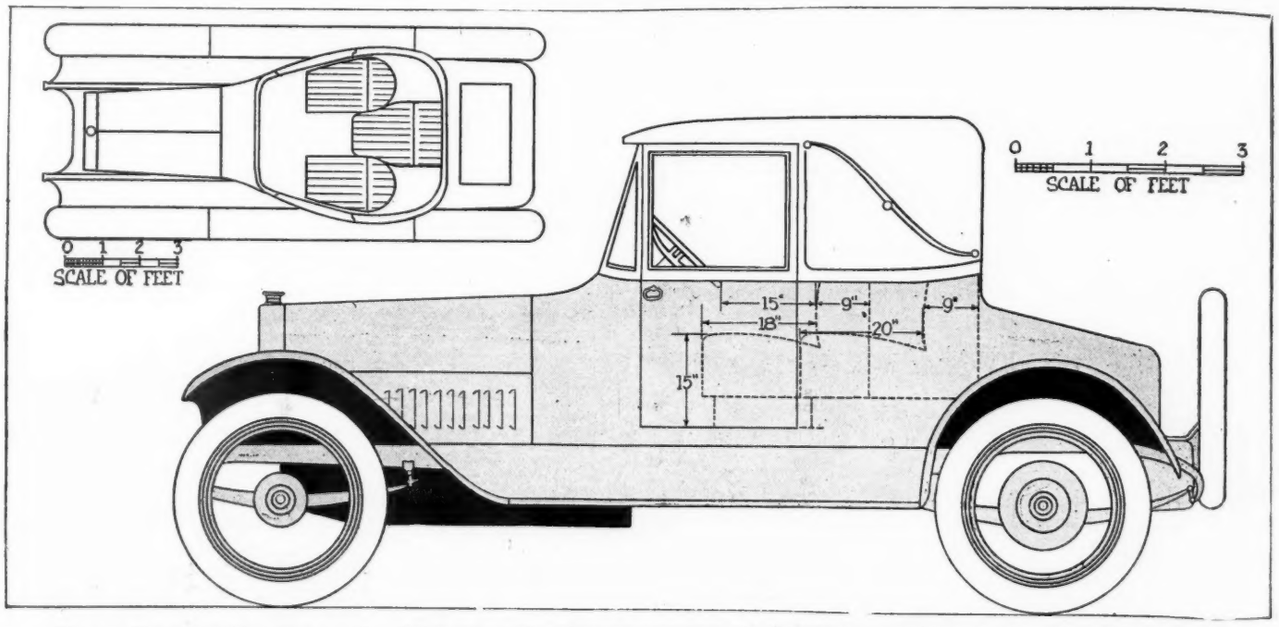
A peculiar result of the situation is that whereas some owners are quite willing to dispose of their cars, and dispose of them at reasonable prices, buyers can be found in other parts of the country to readily absorb such cars, these latter invariably men who absolutely must have a car for business purposes.

The recent phenomenal rise in freights means an average increase in the cost of American cars varying from about $150 to $250 per car, according to size. It can roughly be taken to-day that the actual landed cost of a transatlantic-made machine is fully double the retailers' prices in the country of manufacture. Even so the restriction on freight space is such that any number of cars will find buyers.

Returns published show that during the 6 months ended June 30 last 2529 cars of the declared value of $1,622,765 were imported into the Union. The value of car parts imported was $524,875, and the value of motorcycles and parts was $397,550.

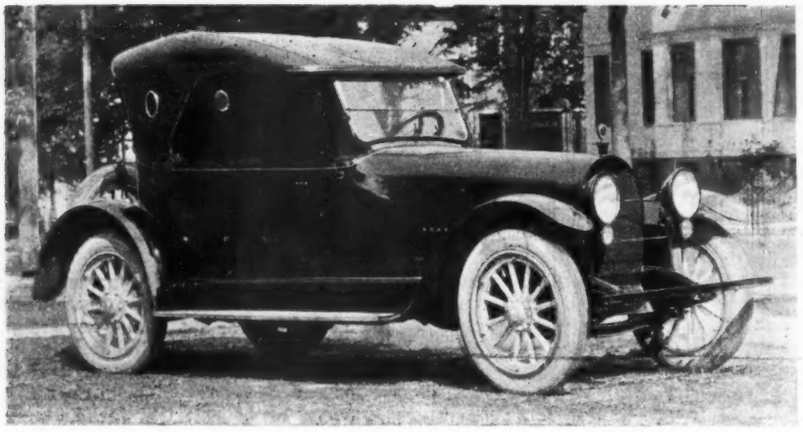
The South African Controller of Imports has issued an official notice to the effect that shipping facilities will not be provided for a variety of articles which he specifies, among them being automobiles and motorcycles, the restriction as regards cars, however, only applying to "automobiles for town use, unless required by medical practitioners or for other urgent purposes." In this country the automobile is, very rightly, regarded as an essential means of transport, having regard to the vast areas not traversed by railways, and the main object of the controller is to put a stop to the importation of what may be termed "luxury" cars. Of course, to prohibit the bringing in of automobiles altogether is quite out of the question in view of the military operations being conducted in German East Africa.

Serious efforts are afoot in this country to discover a substitute for gasoline, and I believe that some little time since one was put on the market by a Natal syndicate. The initial reports were highly satisfactory, and although the mileage per gallon was, I believe, 2 or 3 less than that obtainable by gasoline, this was much more than compensated for by the considerably lower cost. The progressive increase in the price of gasoline during the last 8 or 9 years has been remarkable, and whereas the cost was formerly $2.16 per case of two 4-gal. cans now it is $6.48. So it is quite obvious that there is a big opening for anything that will suitably take its place.

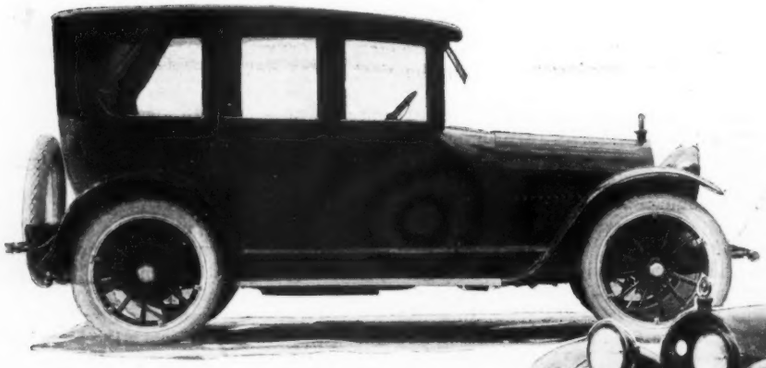


Unusually attractive lines are exhibited on the three-passenger cabriolet built especially for the New York Studebaker branch. It sells for $2,650. The third seat is set back several inches from the other two, giving a cloverleaf effect. The right seat is skillfully hinged so that it may be raised to give more room for entrance or exit. The hinge is so designed that the seat may be easily lifted with one finger

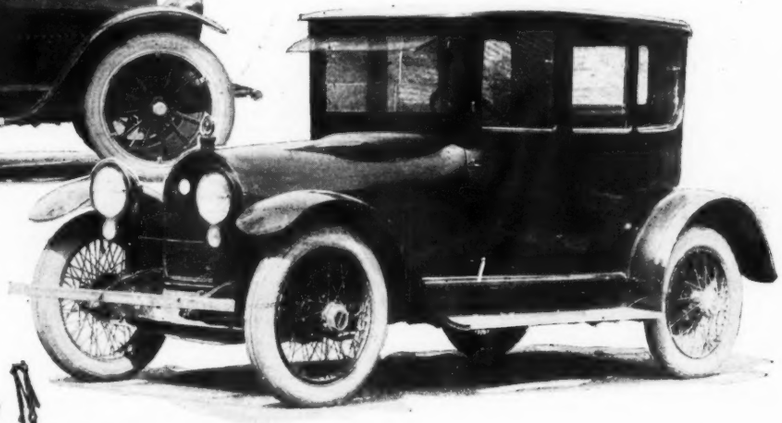
A Selection of Some of the Latest New Cars



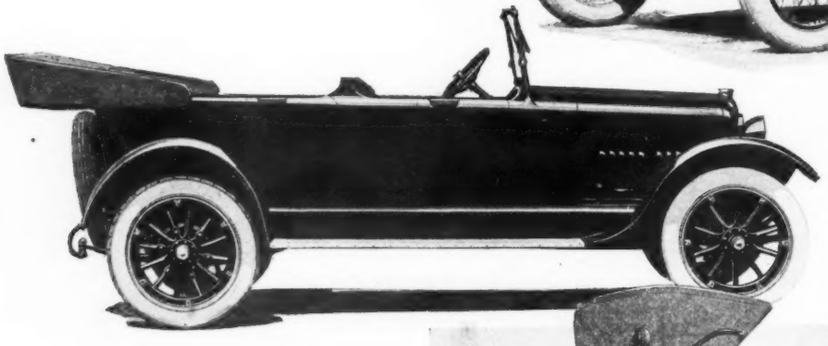
Four-passenger Kissel sedanlet, $1,485; with extra equipment of bumper and cord tires



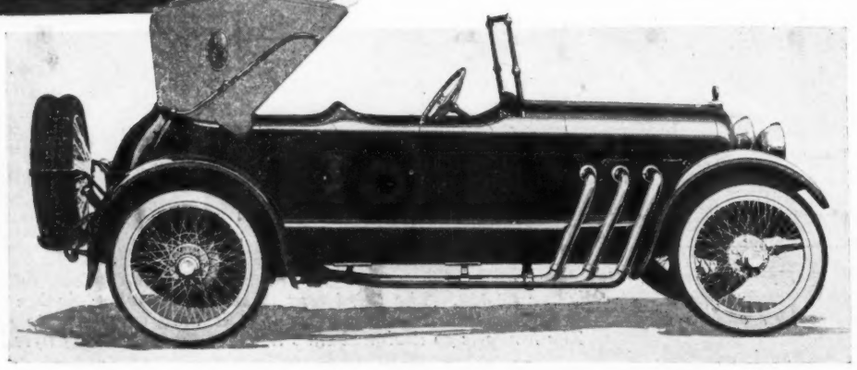
Kissel all-year staggered door sedan, five-passenger, $1,885. The driver enters most easily from the left side



Kissel sedanlet with all-year top, $1,885. Internally the same as open car above

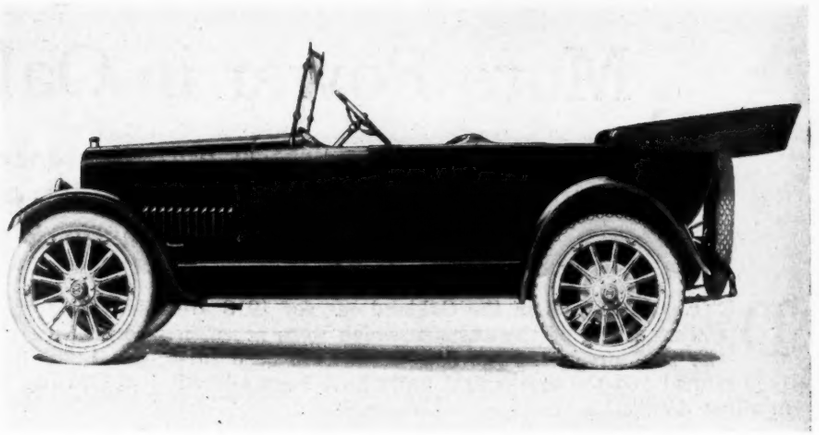


Left — Seven-passenger Velie, $1,595. Interior finish is natural wood and the folding seats disappear completely



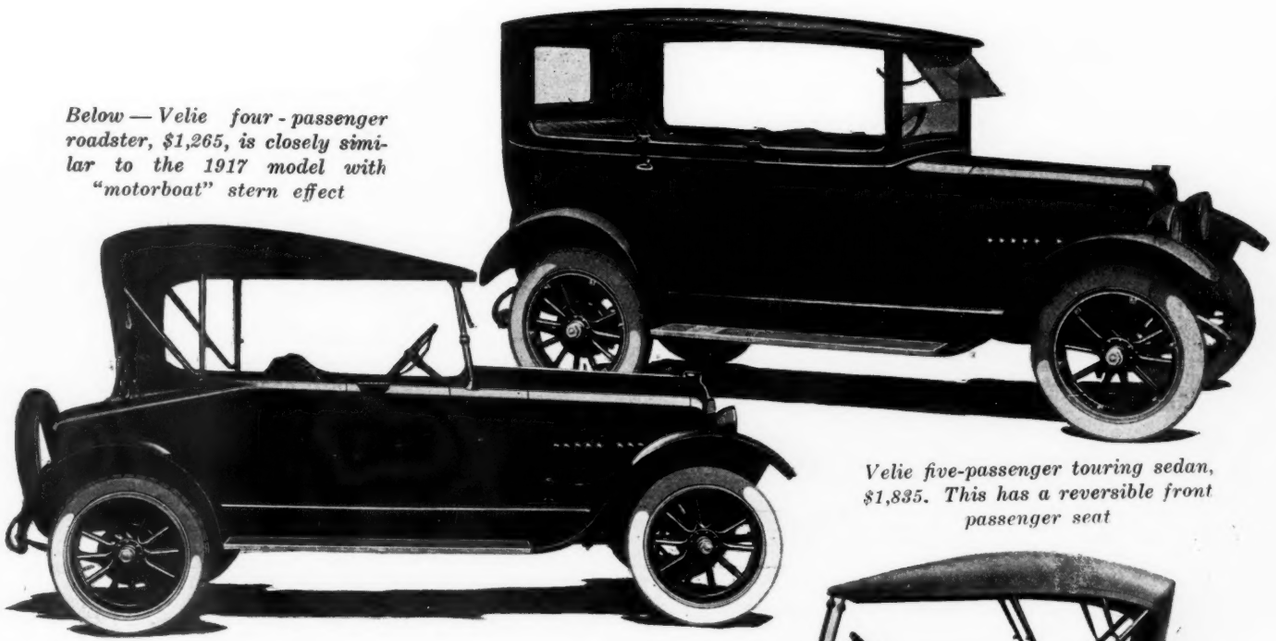
Velie six-cylinder sporting model, guaranteed to do 6 to 60 m.p.h. on high, $1,850. Victoria top and spotlight are included in equipment

To Indicate the 1918 Ideas in Bodies



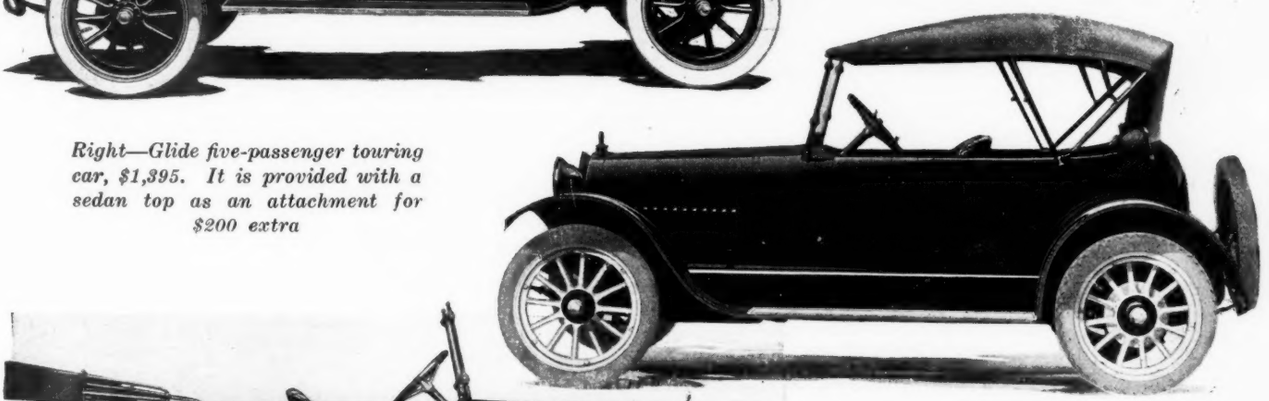
Nash five-passenger touring car, $1,295. Note the curved sweep from the narrow cowl to the much wider front seat

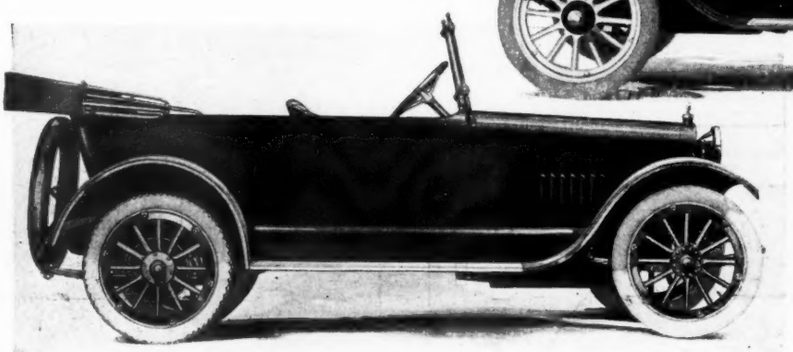
Below — Velie four-passenger roadster, $1,265, is closely similar to the 1917 model with "motorboat" stern effect



Velie five-passenger touring sedan, $1,835. This has a reversible front passenger seat

Right—Glide five-passenger touring car, $1,395. It is provided with a sedan top as an attachment for $200 extra





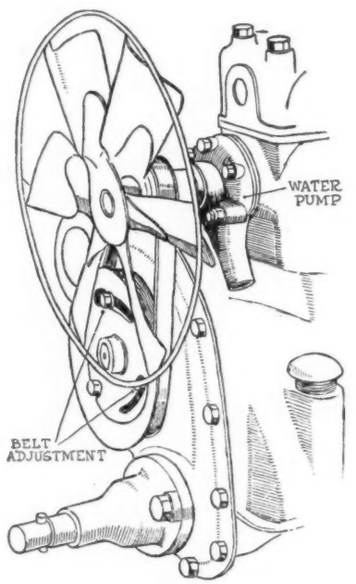
Glide four-passenger roadster, $1,395, with divided front seats and an unusually roomy rear compartment. This body is wider than most roadsters of its type

More Power in Oakland Six

Aluminum Pistons and Machined Connecting Rods Give 44 H. P. at 2600 R. P. M.—New Type of Heated Manifold—Chassis 270 Lb. Lighter

DEVELOPMENTS in the Oakland car for 1918 are continuations of the changes which were noted in the 1917 product. The body lines have been further refined and the mechanical units have been altered in minor details.

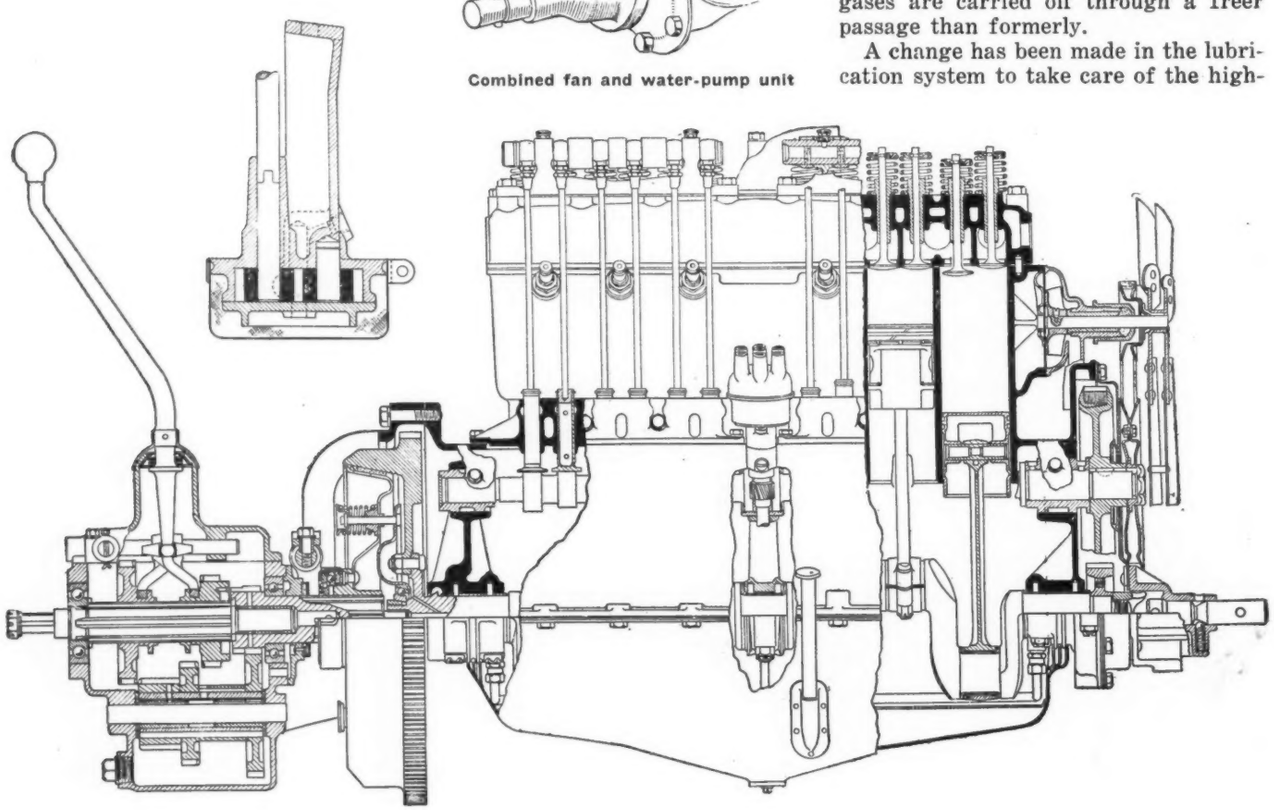
A year ago the Oakland Northway engine, 2 15/16 by 4¾ in., was increased in horsepower from 35 to 41 at 2500 r.p.m. Due to a further refinement, the peak of the curve is now at 2600 r.p.m., where it gives 44 hp. instead of 41. Last year the refinements which produced the gain in power were a new timing, a different camshaft, and a betterment of many of the factors which had to do with volumetric efficiency. This year the increase in power has been secured by a set of lighter reciprocating parts, the adoption of aluminum pistons, and better machining work on the connecting-rods. Thus with the same piston displacement a more efficient engine, giving both better torque and horsepower characteristics, has been developed. Another factor which, taken into consideration with the increased torque and horsepower of the engine, gives a better performance of the car is the fact that the chassis has been lightened and the whole car correspondingly cut down in weight to the extent of 270 lb., giving 48 lb. car weight per brake-horsepower.



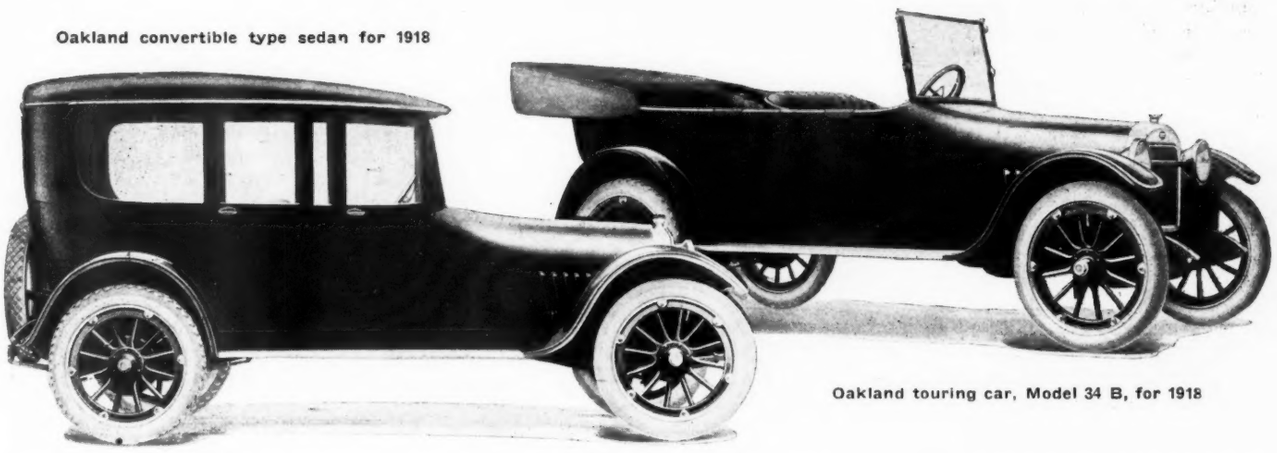
Combined fan and water-pump unit

The question of more efficiently burning the present grade of fuel has also been taken up, and an entirely new intake manifold has been developed. The new manifold has a cast exhaust jacket so arranged that the exhaust passes through a U connection into the jacket of the carbureter, then down through a tube at the side of the carbureter low-speed jet. The greater part of the exhaust heat is given up to the intake at the upper end of the intake manifold, so that a graded heating process is supplied. The upper part of the manifold is kept fairly hot, while the throttle chamber of the carbureter is cooler and the low-speed jet merely warm, the purpose being to allow the mixture to be warmed in stages. Another factor in the improvement of the horsepower curve at its peak is that the exhaust gases are carried off through a freer passage than formerly.

A change has been made in the lubrication system to take care of the high-



Oakland convertible type sedan for 1918



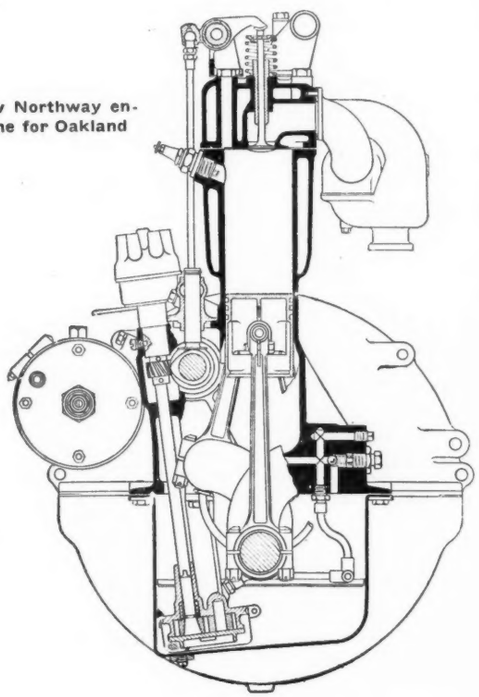
Oakland touring car, Model 34 B, for 1918

speed characteristics of the engine. Instead of the circulating splash system, the oil feed is now by pressure through a hollow crankshaft. The oil pump is a gear type driven off the crankshaft, and the oil is forced in the customary manner through drilled leads to the crank pins, from where it is thrown to the cylinders and other bearing surfaces. A pressure gage is supplied on the dash, and the lead from the crankcase oil pump to the gage is the only external part of the oil piping.

Better Accessibility

From the maintenance standpoint, the new Oakland car has been made more accessible. The removable head is continued, this engine being of the overhead valve type. The head carries with it the entire valve action as a unit. When the head is taken off, the cylinders are accessible for the removal of carbon, and at the same time the valves and other combustion chamber parts can be freely inspected and adjusted. When the bottom pan is removed it is possible to work on the entire engine without further disassembly, as the pistons can be pulled out past the crankshaft and any of the bearings can be inspected and taken up. The timing gears can be reached by removal of the front cover, and for adjustments on the clutch it is only necessary to take up the toe board. The gearbox is fitted with a large cover plate, which facilitates inspection of the transmission units.

New Northway engine for Oakland



The rocker arms are so arranged as to work on a 1 to 2 ratio, so that the lift of the cam is only half that of the lift of the valve. The rockers are assembled on two shafts, each carrying six of them with a support between each two and the rocker. The supports screw into the cylinder head and are easily removable when necessary. For adjusting the valves there is a nut at the top of the push rod at the point of contact with the rocker arm. The valves are 1¼ in. diameter in the clear and the lift is 5/16 in.

One of the features of the engine which is unique is in the front construction, which combines the water pump impeller, fan and fan bearing. This makes a unit of the fan and water pump, with the fan belt driving both. The water connection is direct from this point to the radiator, with the pump case a part of the cylinder block and also forming the fan support. Particular care has been taken to give an efficient belt with the simple adjustment, so that the layout can be readily taken care of by the average owner, and in fact requires little or no attention.

Both manifolds are separate from the cylinders and held to them by dogs and studs. With this arrangement in removing the cylinder head, the entire manifold connection can be taken off with it, and it is not even necessary to remove the carbureter when the cylinder head is taken off. In fact, about the most important connections to be attached are the water and exhaust manifolds.

Gasoline feed is by the Stewart vacuum system in conjunction with a Marvel carbureter. The vacuum tank is on the front of the dash; that is, engine side, with the main tank having a capacity of 12½ gal. at the rear The carbureter is provided with a heated-air intake and is mounted high on the engine. Delco equipment is used for ignition, lighting and starting.

Both the clutch and gearset are in unit with the engine. The clutch is a cone type with a ball bearing release and the gearset provides three speeds with reductions in the gearbox of 3.09 to 1 on low, 1.73 to 1 on second, and direct on high. The reverse ratio in the box is 3.98 to 1. These, of course, are multiplied by the 4.5 ratio in the rear axle for final reduction, giving ratios of 13 9, 7.8, and 4.5 on low, second and high speeds respectively, and 17.9 on reverse gear.

Two universals and a hollow propeller shaft form the drive combination between the unit power plant and the rear axle. Since the Hotchkiss drive is employed, the

master leaves and the front shackle bolts of the springs are part of the driving units, and these parts have been made extra heavy in construction. It will also be noted that the spring supports are well toward the outside of the frame.

The channel member is 4½ in. deep by 2 in. wide and ⅛ in. thick. At the rear the width of the frame is 40¾ in., and it tapers to 28 in., this arrangement allowing of a turning diameter of 36 ft. The semi-elliptic springs forming units at the Hotchkiss drive are 51 in. in length, which is the same as that employed last year.

The rear axle is a Weston-Mott, which is a one-bearing floating type with longitudinally split housing. The brakes are contracting and expanding, operating on a 12-in. drum attached to the rear wheels. The brake layout is such as to give a simple chassis, the main rod in the brake being carried back to the rear cross member, at which point a short connecting link is inserted, transmitting the pull to the brake units. Adjustments on the brakes are made by means of turnbuckles, which are just forward of the rear axle.

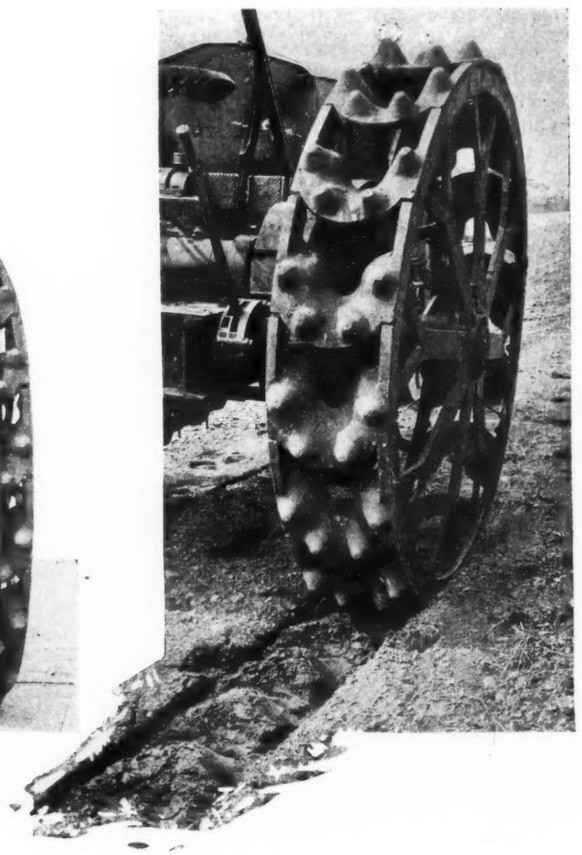
The steering gear is a Jacox irreversible type having a 17-in. wheel. The control is standard and the fittings are complete at the list price. The tires provided are non-skid in the rear and plain in front, and there is a full set of dash instruments, including speedometer, ammeter, gasoline gage, oil pressure gage, switch, etc. The storage battery is an 80-amp. Exide, the speedometer a Stewart, and in addition to these the car is provided with a full set of tools, lamps, license plate holder, etc.

Five body styles are furnished on the 34 B model, which represents the Oakland line for 1918. There is a five-passenger touring and a three-passenger roadster selling for $990; a roadster coupé for $1,150; a five-passenger sedan for $1,190, and a four-passenger coupé for $1,490. The sedan and roadster coupé are convertible types. All these cars are mounted on the same chassis of 112 in. wheelbase, which is the same as that employed for 1917, when the car was lengthened ½ ft. over the preceding model.

The colors this year are coach green for the body and wheels, with hairline red striping. The frame, running gear and fittings are black, with nickel trimmings on the exposed metal parts.

Mastodon Tractor Wheels

The illustration below shows the road bands applied to the wheel; that on the right indicates the effect of the wheel on the soil



ILLUSTRATED herewith is the Mastodon tractor wheel manufactured by the United States Traction Wheel Co. of Chicago. The special feature of this wheel is its tread, which is made in sections. The design of this tread is said to be based on the foot of the mastodon. It is claimed for this wheel that it will work in all kinds of ground suitable for plowing so that it is unnecessary to put on and take off driving lugs. The wheel is said to have such a firm grip that the engine will stall before the wheels will slip. Owing to its construction the wheel does not pack the ground, but leaves it comparatively loose. As the wheel revolves, each "hoof" grips the ground independently of the others, continually creating new bases for traction. For road driving a patented road band is put onto the Mastodon wheel, and this can be done in only 10 min.

Trading With the Enemy*

The Reason for the New Act—What It Means — How It Will Operate

By Hon. William C. Redfield
Secretary of Commerce

FIRST of all, what does the war mean? Have you grasped its significance to your children, to your daughter? Why is she spared by the happy accident of geography, possibly temporarily spared, the fate of the daughters of equally respectable families in northern France, who are taken of the ages from eighteen to twenty-five into Germany to become the officers' servants?

Will you please think of that incident as regards your own family and consider what particularly novel kind of devil it is that is abroad in the world to whom and to whose followers such things are normal, natural, the outcome of a philosophy that means that and worse for you and your children and for me and mine? For we are not engaged in a contest for material things, for money, or for territory, or for power, or influence, or for a place in the sun; *in the last analysis, we are engaged in a conflict against hideous evil in the world, evil enthroned in high places, evil which for its own purposes would willingly take you and yours, which has not hesitated upon our own soil to promote sabotage and slaughter, fire and explosion, and which does not reckon at all human values, if so by it it may be enthroned in power.*

Gentlemen, you are not helping the United States alone in a war when you subscribe to a Liberty Bond; you are doing that, but you are doing a lot more. You are joining with all men of all races and all faiths to *the undoing of an evil which threatens you and has in some part destroyed them.* You are standing side by side with the men of Asia and Africa and Europe and South and North America in one common cause against a hideous wrong.

The ways of commerce are commonly the ways of peace. But the ways of commerce now are the ways of war, for this war differs from all other wars in one great particular. It is not the army alone that fights, but such is the altered character of modern war that the whole nation must be one fighting unit, all of us from the smallest to the greatest, from the youngest to the oldest. The boys in France are merely the spearhead of the United States; that power that actuates the spearhead comes from here. If we weaken here, they fail yonder.

Nation One Unit

Now, it is because the nation in all its forms and capacities is in this war as one great unit that commerce has turned from her peaceful pursuits and herself become a war weapon. I wish we could grasp the necessity of that unity of purpose and unity of action fully; I wish the farmer planting his winter wheat could realize that the boys yonder are strengthened by each additional acre that he plants; I wish that your wife and mine and our children when they eat less butter and less meat knew that the men of France were the stronger for the sacrifice; I wish when we go without some expenditure that we may save, that we understood the enemy was the weaker because we had made the sacrifice.

We have got—you and I—if we are going to win this war —to be one great united war weapon; all of us, child and mother and father and grandparents—everybody. We must all be one, and with that *there is no fear.* The only fear that there can be is that the hundred millions of us shall not be as one.

Now, commerce is used as a war weapon in two ways. First, it is used to provide the nations associated with us in the war with the means of warfare; and, second, it is used to see that our enemies do not by direction or indirection obtain anything that comes from our shores which we can prevent. There is a third element in it, the element of conservation, which has to do not with economy of money, as I think is too often thought, but with the saving of that of which we have but little to the use that must be made of it in the war and the using, on the other hand, of that of which we have abundance in its place.

Now, the acts affecting commerce are those controlling the large acts, the serious ones, those controlling exports. Quite as important, but not so much talked about, is that phase of Trading with the Enemy Act which controls imports, and then the Trading with the Enemy Act itself.

The situation we face is something like this: if our industrial power can be unified, if our agricultural power can be unified, if our financial power can be unified, if our man power can be mobilized, then there is but one end to this thing, for in those respects we alone are stronger than any two of the nations engaged in war. If we can get ourselves together and pull as a team, there is only one result, and the laws I speak of are a part of that process.

U. S. Making Greatest Effort in History

We are exerting the greatest effort in the history of the land. I cannot give details of that exertion in all its forms, but enough has been said to you in public of what is being done in the way of building merchant vessels to have you know that no such effort in that single direction has ever been exerted by any people anywhere.

On top of that is the enormous naval construction, of which I can only say that it includes vessels by hundreds. On top of that is the enormous demand for railway apparatus and appliances. We bid fair to make up by construction of American railways in Europe for what we failed to construct in the United States in the last few years.

I wonder how many of you would have dared believe four years ago that we would have American railways running in Europe, numbering their locomotives by hundreds and their cars by thousands. But such is the fact. If you want to try the possibilities of buying some railroad apparatus try and get a locomotive delivered early and see where you come out. That whole great industry, the whole great steel industry of the country is itself unified on this job.

Now, we are not certain yet that we are going to have, even with all our power, enough, first, for ourselves; second, for our associates; and, third, anything for the neutrals to whom it seems to be safe to sell any goods in these days. That has got to be determined yet.

One thing we are mighty certain of, the margin is at least so near that it doesn't seem wise to sell anything except to carefully safeguarded neutrals, and we must be sure that no American boys are killed for lack of what our industries can do, and that our Allies do not suffer for lack of what they do.

And consequently the principle which lies behind the restriction of exports is the principle of conservation; that our industry shall be so controlled as regards their exports that after our own needs are satisfied, what we sell shall be used to support our associates, and what we have left over

*Address delivered before The Editorial Conference, Tuesday, Oct. 13, 1917, at the Automobile Club of America, New York City.

shall go as freely as we may to places where it is safe to have it go and to persons who use it wisely.

That is the simple principle that lies behind the whole question of the restriction of exports.

Now, the restriction of imports is not our own; it is imposed upon us, but we are the beneficiaries. At the bottom of it lies the same reasoning precisely.

For example, big as we are, we are not yet sufficient unto ourselves. I think one of the things we are going to get out of this war is a realization that you and I belong to the family of nations. We are a big brother; I hope we will have the brother spirit and lay the emphasis on that rather than on the bigness—we are a big brother, but there are others in the family too. And, in the name of God, the little children have got to be looked after by the big brothers lest that happen to them in the future which has been happening to them in the recent past!

But we do not yet produce tin in the United States. I have the keenest possible desire for the success of the tin industry in this country. Tin is precious, and we don't grow it in this country, yet. I doubt if we ever will. I think all the mines of tin that we have found have been planted mines of to-day.

There are certain other things. You take an ordinary tin can and there are lots of things in it that we can't produce of ourselves. For instance, tin, and then the palm oil which is used in the process, and other things. We don't produce the palm oil; we don't produce enough manganese to satisfy our needs, though we are producing a lot more than we did. We have not yet made rubber, one of our regular needs in this country; and I think many American coffee growers have thus far come to grief. Many of these things we must get from abroad.

Control Sources of Supply

Now, Great Britain and France control the sources of supply, for example, for tin; to a considerable amount for wool; to a considerable degree for manganese and rubber and other products; and Great Britain feels, as we feel, that her products must be carefully controlled in their export so that they cannot reach, even by indirection, the hands of her enemies. And so she says that they must be absolutely embargoed except when licenses for sufficient cause shall be granted; and she requires very strict knowledge of the disposition of the goods before she allows them to go out.

We squirmed under that a year or more ago; we are doing it ourselves now. Circumstances alter the cases!

So one of the phases of the "Trading with the Enemy Act" is the control by the President of imports. It had to be general in order to be specific. It is not meant to be, it is not at all likely to be exercised in a general way; it means simply that a body—in this case the War Trades Board—shall be authorized to issue licenses to import prohibited products, and shall import them under such restrictions as that they shall be free for our use, but not free for misuse in the sense of being sold to the enemies of the common cause.

Let me illustrate that by a case which occurred not long ago of a gentleman in one of our cities who had an excellent opportunity to sell manganese ore in Norway. I shouldn't say that much without saying that when his attention was called to the fact he voluntarily cancelled the sale. Now, very obviously, the mere fact that you and I could make money selling manganese ore to anybody nowadays doesn't justify the sale; *we need that ourselves.* Our steel industry requires it. We want every pound we can get, and it would be the highest impropriety for any American in these days to export manganese ore.

So in the same way, if somebody, if somebody outside this country would offer you a fancy price for pig iron, it would be your patriotic duty to refuse to sell the pig iron; we need it here; our country needs it.

Now, those are the principles which underlie—I think they are very simple, very clear—the restrictions of exports on our part and the restriction of imports of the prohibited articles from foreign countries. They both mean the concentration of the world's power against the evil we are fighting.

Now, the daily press has somewhat erred in its characterization of the "Trading with the Enemy Act" as drastic legislation. I grant you that reading it, it reads that way, but as a matter of fact it is rather the reverse. It proceeds to state a number of things that are prohibited.

We had something to do with the drawing of the act; it was prepared after weeks of thought by officers of the Department of Justice and the Department of State and Department of Commerce, with the assistance of officers of the Treasury Department, and was purposely made to be just as inclusive as possible; and then a gate was put in the act so as to let everybody out that had a right to go out and keep everybody in that ought not to go out.

Act Is Law of Nations

The restriction of the act will exist whether there is any act or not. It is and has long been the law of nations that in time of war all communication with the enemy of all kinds is prohibited. It didn't need this act to make it impropriety, an act of wrong, to sell goods to the German in Germany, or to ship goods to South America, knowing that by that means they would reach Germany, or reach anybody so as to aid Germany—that is just as strongly forbidden if this act were repealed to-morrow. *The prohibitions of the act are not new;* they are simply clearly stated and made plain by the language of the law—but they existed before.

The law, then, provides a clarification of these facts making it perfectly plain what trading is, defining it, defining very clearly with whom trading is forbidden; that is to say, defining enemy and defining ally of enemy; but it does not make a new law when it does that; it merely states what was the law before.

Then it proceeds to provide a system of licenses whereby anything which is unlawful in the act or without it, of that character can be legalized by a license.

That is the whole and center and substance of the "Trading with the Enemy Act," the restating plainly and definitely of existing law and the providing of licenses to do, under proper circumstances, anything thereby declared to be lawful.

And really, further than that, there is very little to be said as to the law and its purpose. But it may interest you to call attention to the point of view held of the law by the committees of Congress that approved it. The Senate Committee said:

> "The purpose of this bill is to mitigate the rules of law which prohibit all intercourse between citizens of warring nations and to permit, under careful safeguards and restrictions, certain kinds of business to be carried on."

Observe, therefore, that it is permissive from what I read from the opinion of the Assistant Attorney General, who took part in drawing the act and in which he says:

> "The present bill is less stringent and designedly so than the present English act, and it is less stringent than the law of trade with the enemy as laid down by our courts, for it provides for a system of licenses by which any act or business forbidden by the bill may be licensed to be done under proper conditions."

So that you have had the Senate and the Executive viewpoint, and now the House Committee say concerning it that "the chief objects of the bill are to recognize and apply concretely, subject to definite modifications, the principle and practice of international law interdicting trade in time of war."

Alien Property Custodian

Now, there is in the bill, however, a very original, as far as I know a novel clause—I am not sure whether anything like it exists in Great Britain or not; I have never heard of it certainly, anyhow; but certainly something which is entirely novel to our law, our practice, and that is the creation of the alien property custodian.

I need hardly say to you that there is a very considerable amount of property belonging to enemies in this country, money which has been invested by Germans or Austrians or others before the war. A very considerable body of stock in a good many corporations is so held.

This clause provides a custodian, an official custodian to whom all interest, dividends, etc., belonging to such enemies or enemy allies can be paid.

In the original bill it had to be used for certain purposes, but in the present form it may be used to purchase Government bonds, so that in that way the property of enemies may be

used to finance the war against them, with the understanding, which is a very interesting one and one which is the act of a good sport like Uncle Sam, that this property is not confiscated, but it is by the alien property custodian to be preserved and after the war Congress may, at its own will, dispose of it as it sees fit; which means, of course, that it is quite possible, I think it quite probable, that it will be returned after the war intact to its original enemy owners, we having had the use of it meanwhile for our own purposes.

New Legislation

That, I think, is an entirely novel piece of legislation. It has certain interesting adjuncts. A debt due to an enemy or to an ally of an enemy can be paid to the alien property custodian and a full discharge thereby had of the debt, so that obligations due to Germans or Austrians or Turks or Bulgarians can be cancelled by the payment to the alien property custodian in this country.

Now, I think that, with one exception of a great deal of interest to you, constitutes the weight of that measure. The exception has to do with patents.

It is deliberately left open in the bill for an American citizen to obtain, providing Germany shall reciprocate, patents in an enemy country during the war and for our enemies to obtain patents in this country during the war, and it is also provided that any American manufacturer or industry may apply to the President or to the War Trades Bureau, where it has been placed by the direction of the President, for a license to use, during the war, any patent belonging to an enemy or to an ally enemy existing and valid in this country.

He may use that patent if he secures a license for a very small fee, limited, I think, to $100, but he must pay 5 per cent of the value of the articles which he makes under that patent into the alien patent custodian.

At the end of the war the law provides that the foreign owner may sue in our courts within a year for a royalty for the use of that patent, and if he recovers, the law provides, however, that any defense which would ordinarily be made against such a suit shall be valid. In that case, if he should recover, then this 5 per cent fund that he has paid in, so far as it goes, shall be used to pay the judgment. And if he does not recover, or if during the year he does not bring suit, then the 5 per cent is to be refunded to the American user.

Now, that is a principle of a great deal of value and already in one important case has been brought to my attention by parties desiring to avail themselves of important patents now existing in this country.

I think I have covered the substance of the measure; I am not much concerned with its letter. The letter of a law has always to look rather firm, not to say severe or stern. The spirit of law is another and a very different thing. It has been placed so far as its administration lies in the hands of the War Trades Board.

Personnel of Licensing Board

That Board is composed of a representative of the Department of State, Department of the Treasury, Department of Commerce, the United States Shipping Board, the Department of Agriculture—I think one other; there are six, as I recall. It is the Export Administrative Board under another name, with the addition of a representative of the Treasury and of the Shipping Board.

The men are practical men, and not so far as I recall them men who were governed by officials before the war. The representative of the Department of Commerce is Mr. Thomas D. Jones, who was its representative on the former Exports Administrative Board. Licenses for any act substantially under the law shall be applied for to the War Trades Board. The Department of the Treasury, however, is placed in control of the exports of gold or of credits or of exchange under the law.

It is possible, you know, to export credit by wireless; it has been done and done a good deal. That is no longer possible. That is placed under the control of the Treasury Department. The final authority as to the clearances of vessels that have upon them articles prohibited to be exported is placed in the hands of the Department of Commerce. It is simply another one of the war weapons. It completes the cycle.

Here in our free country, where we have preached individualism and believed it was sufficient for all circumstances, has arisen something so malign, so serious, that almost without objection, so far as I know, without serious objection, anywhere, we have given up the free right to trade where we will and have concentrated the peaceful power of commerce into a mighty weapon of war.

It is, of course, true that a very considerable amount of food has gone from the northern neutrals into Germany—meat, cheese, milk, butter, a great deal. I don't think it has been especially concealed. Our attitude on that matter is very simple and very, very clear. It has been plainly expressed, there is no reason why we shouldn't state it, that we will not sell to anybody anything which is going to be sent into Germany and help her to kill our boys, nor will we sell to anybody anything which they can use to replace something that they sell to Germany to help kill our boys.

If, now, any people advantageously located to our enemies have domestic needs independent of any export trade of theirs, needs which they cannot satisfy, be it food or fodder—which are the two things chiefly concerned—our point of view is tell us the facts, lay your whole cards on the table—export cards, cheese cards, milk cards, cream cards, butter cards, beef cards, all cards; spread them out where they can be seen. Now, tell us what your people need.

We are ready on those facts—only on those facts, with a clear and definite understanding to render any assistance possible. We furnish nothing for resale and nothing to supply anything else which has been resold or is to be, but on those facts we are ready to go to our people and say: "You eat less of this and less of that and save" and we will sell you all we can spare for those needs, under those circumstances, after our own people have had what they need, and after the nations associated with us in the war have had what they need, you shall have a share for your domestic needs of what is left. That is all there is of it. It is perfectly simple and perfectly plain, but it is entirely firm.

Now, I am going to close by reading to you two things which gratify my soul as a manufacturer. It may be that is because one likes to see his own ideas improved, and yet I think to this group of editors these two utterances—very brief ones—ought to be made clear.

England's Experience with Labor

It is the address of the Right Hon. Christopher Addison to the English Parliament, made on the 28th day of June last, on the work of the Ministry of Munitions in Great Britain. I think you know how colossal that work is. They were running long ago 4000 factories on munitions alone in Great Britain, and this is his experience. I commend it to your serious thought, the two of them. They are very unlike.

> "Nothing in the relations between capital and labor gives rise to more difficulty and distrust than two customs which are dependent upon one another. The first is the cutting of rates of pay on piecework, so as to limit the rise of earnings when improved methods of manufacture leading to a great output are introduced. It is not the practice of the best employers, but it is adopted by many. This practice or the fear of it has inevitably led to the second and retaliatory practice of the restriction of output. The influence of these two practices in our industrial life is thoroughly poisoned. We must establish a system whereby both parties have a direct interest in the introduction of improved methods. Without it our progress will inevitably be accompanied by endless disputes. The accounting side of the Ministry has abundantly proved that modern methods of production are not only well able to afford good wage rates, but are benefited by so doing."

And second:

> "We have suffered in the war not only from old-fashioned plant and negligent finger methods, but from a serious neglect of research and scientific work as applied to industry. I should like to acknowledge the help which has been afforded by the Committee on Scientific and Industrial Research in the origin of which I may perhaps claim some parental pride. Our manufacturers are awakening to this need and so is labor, and I cannot think of any national investment worthier of thought and of cost than this one."

Make Testing Accurate

Laboratory Should Be Strictly Disciplined—Drilling Testing Staff Aids Accurate Records —Tabulated Records Avoid Repetition of Tests

DETROIT, Oct. 19.—Laboratory Testing as Applied to the Automotive Industry was the subject of the October meeting of the Detroit Section, Society of Automotive Engineers, held at the Hotel Pontchartrain last night. The paper is the result of the joint efforts of the members of the Laboratory Testing Committee, which is part of the general research committee having this work in charge.

The members of the committee presenting the paper are R. M. Anderson, research engineer for the Packard Motor Car Co., chairman; O. C. Kreis, research engineer of the Continental Motor Corporation, and F. C. Wendland, laboratory engineer of the Hudson Motor Car Co.

The paper took up the various phases of testing and showed the reflection of the testing laboratory in the design and performance of the car. The effects of the laboratory work upon the history of development in any motor car company were touched upon, and one of the principal points brought out was the ability of the laboratory to search out the fundamental reasons why any design is successful, not only upon the road, but in filling the coffers of the concern which builds it.

As a manual for the conducting of a clean-cut laboratory test the paper should be valuable, because it becomes evident that the more the matter is studied the greater the necessity appears for practically military discipline in the laboratory, with responsible people in charge of definite duties and with no laxity permissible in making departures from routine methods. With a laboratory handled in this way the readings and results are more accurate, and consequently vastly more satisfactory from an engineering and commercial standpoint. A digest of the paper as read by Mr. Anderson follows:

Data Must Be Unquestionable

The data furnished by the laboratory must be unquestioned. To be accurate and control the disturbing conditions requires close attention and elaborate equipment. Yet the equipment should always be as simple as possible. The methods by which results are obtained are frequently as necessary to understand as the results themselves.

Testing equipment can to-day be purchased upon the open market that will obviate the special designs formerly thought necessary. So far as possible this standardized apparatus should be used to avoid mental calculations to interpret some other engineer's report.

We believe that the length of brake arm, revolution counting device, gasoline and water metering methods, etc., should be standardized as far as possible. The addition of the aircraft, tractor and marine motors will also require careful revision of tests suiting their widely differing needs.

The situation of the motor testing plant and its general relation to the rest of the factory is quite important to the personal equation of the men conducting the tests. Plenty of light and at the same time ventilation are absolutely necessary. Unobstructed room around each testing unit must also be provided in case of fire. This fire danger is greatly minimized and easily controlled if the man operating the extinguisher has plenty of freedom. This has been emphasized by tests on large motors where the gasoline stored is not only of large quantity but under high pressure. The necessity of using a large quantity of fuel was occasioned by the type of motor tested and the fact that on this economy run the gasoline scales were located not far from the carbureter.

As for quality of apparatus too much stress cannot be laid upon purchasing the best obtainable and so far as practicable having its operation similar to any previous equipment. The operators then do not make unavoidable mistakes at the wrong time, such as making a wrong contact with the switchboard.

The requirements of the proper interpretation of readings are increasing very rapidly with our intensified war production. Frequent repetitions of long runs where a large amount of data must be taken have demonstrated the value of a military type of organization where each man at the scales, or the thermometers, etc., is held absolutely responsible for one detail. After a surprisingly short time the co-operation of these men in keeping to the requirements of the test becomes automatic. The data from each man are collected at regular time intervals and the observations carefully inserted at the proper place in the report. It is also found of great assistance to plot upon a large blackboard a graphic log of the run. This is in full view of every one and acts as a moving picture of the motor's performance. The run does not have to be finished before the motor has told its story. Fuel economy, oil consumption and general power are not only observed while the motor is in action but any variation is immediately detected.

Training by Repeat Runs

The assistants will quickly respond to the training of repeat runs and become capable of taking dependable data. No run of importance should be undertaken until the general average of the observers is as thoroughly tested out as the motor. The advantage to the engineer is obvious. His attention can be concentrated upon the detail that is under test, knowing that the chances for error are as small as possible. As an example the man handling the dynamometer switchboard will almost anticipate the engineer's signals and maintain the speeds and loads upon the motor being tested. This same man with his specialized familiarity of operation can best handle any unusual tests and clearly understand what points require bringing out.

It is usually the lack of familiarity with some test which upsets the dependability of the result. Or it is equally true that it is so like one that preceded it that the mistake is natural. To avoid this, standardized or rather familiarized tests are used as far as possible. The method employed is something like this:

The department receives orders or originates orders for testing a change in valve material. The foreman of the testing laboratory is referred to a previous test which has been used successfully to bring out the endurance of valves. In this test is given the complete list of apparatus used, which he is to set up together with the motor, duplicating exactly the approved conditions. The motor speed, load, spark setting, water temperature, etc., are also given, and when he is ready the run is started and the engineer notified. As long as no further notification is given the test is all right and the foreman assumes responsibility, keeping the engineer informed as to the number of hours he has run and any unusual indications of good or bad performance. Thus the engineer can determine the length of time necessary to keep this valve on test, etc.

Simplifies Record Writing

Upon completing the test its writing is thus greatly simplified. The laboratory record is kept in its files, while the

final report simply refers to the test being conducted upon lines duplicating a standardized test of a certain number. The interesting and unusual performances are condensed and compared with other similar tests.

For the purpose of furnishing duplicates of the report the first sheet of the typewritten report has the carbon reversed, thus printing on both sides and making blue printing possible at any future date. Extra carbon copies are written for immediate distribution and, of course, are cheaper than the prints. These carbon copies are distributed to those interested and criticism is invited. The original is properly filed for reference and for making blue prints if extra copies are ever needed.

If it is impossible to use a standardized test owing to the lack of similarity or some new development, the foreman receives an order with the details carefully enumerated, borrowing from standardized tests where such matters as water temperature, etc., are to be regular. It should be noted that the smallest detail is given, the borrowing being simply copying established standards. If this test is ever repeated it then becomes a so-called standard. The foreman then has no excuse for lack of information about the test, and, furthermore, the report will be turned in with a careful record of what the set-up actually consisted.

Of course reason has to be used to save needless clerical work. Thus a test may be the same as some previous one, and this will be stated and exceptions noted which in this case will require special attention.

Use a Blackboard

As in the case of the graphic log used in long runs, it has also been found that the use of a large blackboard bearing the captions of the curve sheets with proportionate rulings is of great value. The performance of the motor on its last test is plotted upon the board and the pounds pull written directly upon the curve where it intersects the r.p.m. Thus on the repeat run with the hopeful changes made we can compare quickly the scale readings with those secured before. Obviously the blackboard may be used with equal effect for a generator test where a comparison is to be made with what is known to be a good output. I might add that the boards are hung to the ceiling with weights the same as windows, thus making possible their immediate use or removal.

Quite as important as the excellence of the equipment and its dependability for accuracy is the elimination of the time element between set-ups. Weather conditions may be such that an unusual result is noted. To get a picture of this same phenomenon on another type of motor or with a proposed means to eliminate its effect requires fast work. Of course the ideal method is to have several dynamometers, but this will not remove the chance that the extra motor will always be set up waiting for the condition to arise. A new layout is to be discussed later, and we shall then endeavor to show how a change may be made in a matter of a few minutes.

So far as possible the minor measuring instruments should be carefully calibrated to read in units that will save calculation later. Or wherever calculations are unavoidable the readings should be made in tenths of time intervals or quantities as the case may be.

Checking Fuel Consumption

Frequently it is necessary to check the actual fuel consumption before tests are made which do not involve the carbureter. To weigh the gasoline requires an appreciable quantity before accuracy is assured. Many laboratories are consequently using a volume measurement in place of weight. The volume can be of a constant quantity and the time measured, or the quantity variable and time constant. For use on car motors the former is preferred. Any arbitrary amount can be taken, but for easy calculations a tenth of one gallon is very convenient, governed, of course, by the horsepower to be taken. The container is made of large glass tubing with both ends drawn out in reduced area. The small ends are provided for close readings. The tube is calibrated with a standard burette for whatever quantity is to be used, and the limits indicated at both ends of the tube. The lower end is connected with a three-way valve and piped up so that the motor does not have to be stopped during any of the operations necessary to measure the fixed quantity of fuel. Very accurate readings may be quickly made with this instrument.

For measuring the cooling water of the motor, venturi meters will be found invaluable. These simple instruments can be safely relied upon for accuracy with 2-3 per cent and may be purchased complete with manometer calibrated for any units desired, i. e., gallons, pounds or cubic feet per minute.

With carefully built instruments and proper handling the laboratory is capable of building up for its company a valuable history of the work it is doing. If history must repeat itself, it should be along the line of design which has been proven sound and lasting. The executives of any organization know the paying models, but the laboratory must write this history in such a way that the causes of good and poor design may stand out and be able to insure a successful future to the particular company and the industry as well.

The laboratory data should be constantly compared with actual results in service if the data are to be depended upon as prophetic of the designer's success, and for this reason it is well to have similar subjects so related in the files that their respective reports will be simultaneously available. A motor for its particular field requires an exhaustive study of the conditions of that field. It is absurd to apply all the tests to a truck motor which are necessary to an automobile. Similarly the tests upon an aircraft motor are far removed from those upon a tractor.

In order to be entirely familiar with the various parts which go to make up the finished unit and properly comprehend the design, cylinders, water pumps, crankshafts, etc., should be capable of adequate tests in the laboratory. This frequently also avoids a delay in taking the part to a far distant part of the factory where a special test is used for production.

Outside-purchased accessories such as generators, starters, ignition devices, etc., are of course tested before going on the motor. It has been found of great assistance to not only plot the capacities of such accessories on the usual r.p.m. basis but to add the corresponding miles per hour.

Taking Starting Torque

For starting motors the torque required to turn the engine at a given speed should be furnished the builders of the electrical instruments. This torque, however, is not the torque which the dynamometer will register when connected to the flywheel. If this be used the large inertia of the armature will produce false results as the number of cylinders is decreased. The test should be through the train of gears required for the starting motor installation. The starting motor pinion being fastened to an extended armature shaft of a small high-speed dynamometer enables the torque required to be more accurately determined.

So far only incidents of laboratory work have been touched upon, and it is not proposed to go into a lengthy discussion of the wide range of subjects before us. It will be worth while, however, to go into further detail regarding a few problems common to the motor and accessory manufacturers.

The cooling of motors of present-day construction is a problem requiring attention, since the changing fuels and attendant changes have an upsetting influence upon previous standards. We do know this much by way of explanation, that with kerosene as fuel the cooling difficulties are increased. How much has not been determined.

The cooling question is a lively one and brings in all who are interested in the final assembly of the car, including manufacturers of rear axles, radiators, carbureters, fans, hoods, pans, etc. This one test in particular has been chosen that we may set in motion a discussion of the methods of securing this data and endeavor to agree upon the best.

Should the cooling system prove inadequate at the height of the season and customers find the difficulty seriously interfering with the car's service, there is but one choice for the manufacturer, namely, to correct it. To do this the cause or causes must be settled and the blame justly placed.

(*Continued on page 741*)

Altitude Effects on Tractor Engines

Simple Device Measures Loss of Power at Any Height During Test at Fixed Altitude

IT is a well-known fact that an engine loses power as altitude increases. While these losses can be estimated, it is far better to try it out experimentally, as they vary in different types of motors to some extent. This variation is due to design of intake manifold, carbureter, gas passages, valves, number of cylinders, size of cylinders, and speed.

It is most essential that every manufacturer of tractors should know just what these losses amount to, for should he sell a machine in a country where the altitude is, say, 6000 ft. above sea level, his machine which may be a three-plow outfit at sea level will be found to be not over two at that altitude; in fact, from the curves it will be seen that a motor of the type tested gave 20 b.hp. at sea level, and would only pull 14¾ b.hp. at 6000 ft. This leaves the manufacturer one of two courses: when the machine is to be used at high elevations he can either guarantee his machine as a two-plow outfit or he must install a larger motor to do the same work at this altitude that the smaller one will do at sea level. The reader will see from the above case how important it is to know just what to expect of a motor when used at high elevations.

Making 10,000 Ft. from 600 Ft.

One manufacturer realizing the importance of this, after having had considerable trouble from this cause, determined the brake-horsepower that would be developed by his particular motor at altitudes as high as 10,000 ft. As this manufacturer's plant was located about 600 ft. above sea level it was necessary to carry on this experimental work at that altitude, and the method used was as follows:

The engine was a two-cylinder opposed type having cylinders of 5¼ x 7 in., with a normal speed at full load of 700 r.p.m. The manifold was of the conventional type usually used on opposed motors, and was 1½ in. inside diameter; the carbureter was a 1½-in. Kingston.

The cooling system consisted of radiator fan, pump, etc., as used in actual practice, all being connected up, and working just as when mounted on the tractor.

The motor was mounted on a temporary stand on the test floor, and was connected to a Prony brake for absorbing the power. The air intake to the carbureter was connected to a light steel receiver (18 in. dia. by 48 in. high) by 1½-in. piping, this being made up air tight. There was a 1½-in. gate valve screwed into the receiver, and a mercury column.

It is evident that all air to the carbureter must pass through the 1½-in. gate valve, then through the receiver and the 1½-in. pipe. Also, that as we close up on the 1½-in. valve a vacuum will be produced, the amount of which is dependent upon the amount the valve is closed. In this way we can get the same conditions that we would have at any altitude, except that the piston on the exhaust stroke is doing more work than if the engine was in the actual altitude; however, this correction is easily and accurately made, taking a specific case as follows:

On the sheet showing the results of tests with 64 lb. per square inch compression it will be noticed that when the suction pressure was 20.4 in. of mercury the actual brake-horsepower was 10.87 and the brake-horsepower corrected for this back pressure during the exhaust stroke was 12.11.

Pounds pressure below atmosphere in this case = $(30 - 20.4) \times 0.49 = 4.7$.

Then substituting in the i.hp. formula

$$\text{I.hp.} = \frac{\text{Plan}}{33{,}000} = \frac{4.7 \times 0.583 \times 21.65 \times 700 = 1.24}{33{,}000}$$

Then correct hp. = 10.87 + 1.24 = 12.11.

P = mean effective pressure during the exhaust stroke = 4.7 lb. per square inch.

l = length of stroke of engine, in feet = 0.583.

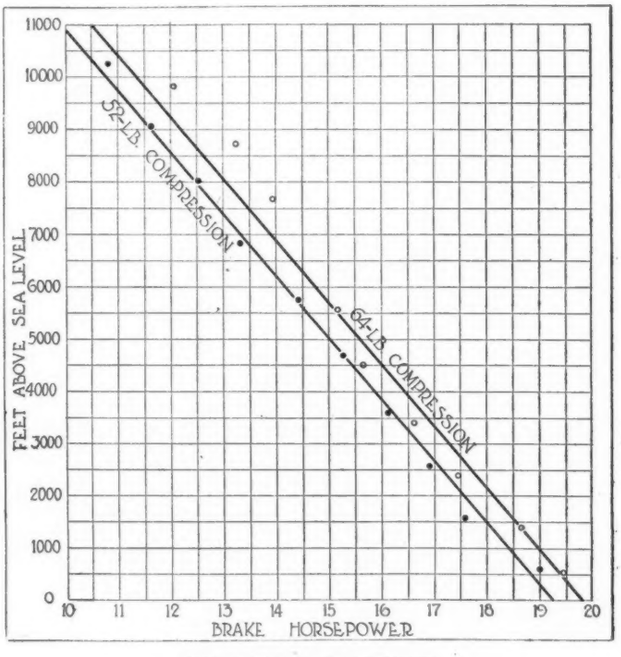
a = area of piston, in sq. in. = 21.65.

n = revolutions per minute = 700.

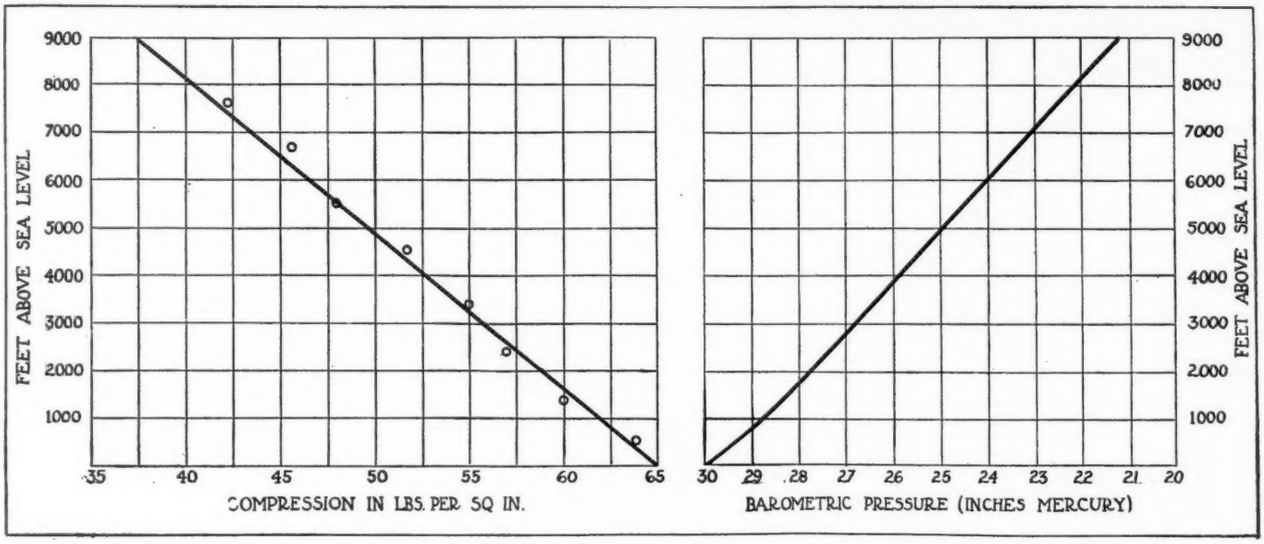
I.hp. = indicated horsepower.

Motor Speed Constant at 700 R.P.M.

In running these tests the motor speed was kept constant at 700 r.p.m. First the carbureter was adjusted so that the motor would pull its maximum load with no resistance to the carbureter air (1½-in. valve wide open) and the maximum load of motor obtained at this point. Then the 1½-in. valve was closed until the suction pressure was increased 1 in. of mercury, carbureter readjusted to pull maximum load at a constant speed and the load noted. This was repeated, taking increments of 1 in. each time up to 9 in. of mercury of suction. During this series of tests the



Effect of altitude on power



Curves 2 and 3—relation between compression and barometer and altitude

compression was 52 lb. under the actual atmospheric conditions (1½-in. valve wide open).

A second series of tests were run with a 64 lb. compression pressure. During this second series of tests the amount of compression was measured for each different suction by the use of an Okill gasoline motor indicator.

Results of Tests

The results of these tests are given in tabulated and curve form. Table 1 gives the results using the 52 lb. compression, Table 2 the results when using 64 lb. Curve 1 gives the results of both series plotted graphically, the ordinates being reduced to feet above sea level instead of inches of mercury. Curve 2 is a curve showing the relation between feet above sea level and barometric pressure, and Curve 3 shows the relation between altitude and compression pressure. This apparatus and method were most satisfactory in every respect, and the writer can recommend it highly to any manufacturer who cares to do any of this work on his motor.

TABLE 1

Altitude Tests on 5¼ x 7-in. 2 Cylinder Opposed Gasoline Motor 52 Lb. Compression

Suction Pressure Hg. Absolute	Brake H.P Actual	Brake H.P. Corrected for Exhaust
29 20 (Bar.)	18.92	19.03
28.20	17.35	17.60
27.20	16.51	16.87
26.20	15.67	16.17
25.20	14.64	15.29
24 20	13.70	14.45
23.20	12.44	13.32
22.20	11.50	12.53
21.20	10.45	11.60
20.20	9.51	10.80

TABLE 2

Altitude Tests on 5¼ x 7-in. 2 Cylinder Opposed Gasoline Motor 64 Lb. Compression.

Suction Pressure Hg. Absolute	Compression Gage	Brake H.P. (Actual)	Brake H.P. Corrected for Exhaust
29.40 (Bar.)	64.	19.43	19.47
28.40	60.	18.39	18.63
27.40	57.	17.13	17.45
26.40	55.	16.1	16.57
25.40	52.	15.05	15.65
24.40	48.	14.41	15.15
23 40	46.	13.27	14.16
22.40	42.	12.96	13.95
21.40	34.	12.12	13.25
20.40	24.	10.87	12.11

Causes of Fires on Sudden Landings

FIRES following sudden landings of airplanes are often attributed to overheating of certain engine parts, or to short circuits in the magneto or its wiring. The heating of engine parts is not always sufficient to explain the reason for the fire, and the insulation of the wires of a magneto is generally sufficiently perfect to make it impossible to attach the blame to it.

L'Aerophile suggests another explanation for these fires, which, though not of universal application, may elucidate some cases. It has been shown that the friction of the gasoline in the small tubes gives rise to an electrical difference of potential, the liquid becoming negatively charged and the container walls positively. At the moment when the flow in the small tubes stops, a discharge takes place, similar to that of gas strongly compressed. In order to obviate the resultant danger it is proposed carefully to cover the inner walls of the tanks and piping with a thin layer of non-conducting material.

Another preventive would be to add minute quantities of acid or alcohol to the fuel, these reducing the conducting power. *L'Aerophile* suggests the desirability of experiments to solve this problem. It calls attention to the fact that the Germans, who in connection with their Zeppelins and Schutte-Lanz dirigibles fear nothing more than accidental inflammation, not only attach great importance to easy landing, but take great care that the inflation proceeds at a slow rate, so as to avoid accidents due to the generation of electricity.

Radiator Filling in Factories

A VERY ingenious method is in use by the Liberty Motor Car Co. of Detroit for filling the radiators of the cars as they leave the assembly line and are run for testing. It is desired to avoid splashing the car with water and to prevent escape of any to the floor. Since all the radiators are exactly the same size it is only necessary to have a measured supply of water ready for each. This is provided by a tank mounted on the wall of a capacity just equal to that of the radiator and provided with an automatic filling cock controlled by the conventional ball valve. The tester has merely to insert the hose in the radiator and trip the discharge valve. The tank thereupon empties completely and fills up again while the next car is being brought into place.

Coal Gas as Automobile Fuel

Methods of Storing on the Vehicle—Effect of High Compression on the Calorific Value of the Gas—Precipitation of Naphthalene

IN England, where, according to recent reports, gasoline is now selling at $1.12 per Imperial gallon and where the amount that can be bought at that price by any individual or firm is strictly limited by Government regulations, the incentives to adopt other fuels for use in motor road vehicles are certainly very powerful. Pleasure driving is dead, but commercial vehicles must be kept moving and recourse has been had, in the case of motor omnibuses for urban use, to coal gas. An official report has recently been made by the Executive Committee of the British Commercial Gas Association in which are discussed experiments along this line made by the association.

The committee states that the only substantial difficulty in the way of substituting coal gas for gasoline is the bulk of the gas; accordingly, chief attention has been given to various storage systems and to such important considerations as the effect of compression on the quality of the gas. As regards the more common method of storing the gas under normal pressure in a large flexible container, it is pointed out that the practical disadvantages of this system are the extremely fragile nature of the holder and its bulky dimensions, which seem to unfit it for hard work in towns. Nevertheless, the simplicity and low cost of the system warrant careful consideration of it as a war measure, because, although the volume of gas that can be carried at atmospheric pressure is limited owing to its bulk, this disadvantage is to some extent compensated for by the ease with which the gasholder can be replenished. Indeed, in view of the present difficulty of obtaining pressure receivers, it is hardly possible to use gas in any other way. It is pointed out that owing to the very low pressure—only about two-tenths of an inch water gage—exerted by the gas contained in a flexible container a meter delivering into it discharges practically as though it were open to the atmosphere, and, accordingly, races unless some form of throttle is interposed. A short length of small bore piping or a diaphragm with a suitable aperture is recommended so as to retain the pressure drop in the meter within reasonable limits.

Storing by Compression

Consideration is given to the method of storing the gas under pressure in steel cylinders, and, for practical reasons, a pressure varying from 20 to 25 atmospheres is recommended. It is particularly instructive to note that the effect of compression on the calorific power of coal gas, if the compression is carried to 120 atmospheres, is a reduction amounting to 10 per cent. In experiments made to test this point, a cylinder of gas at a pressure of 120 atmospheres was discharged through a reducing valve into a calorimeter and frequent observations of the heat developed were made. It is found that the calorific value remained almost constant during the time the gas was discharging and the pressure falling. There was, however, a rise in the number of B.t.u.'s developed during the last few minutes when the pressure was falling from about three atmospheres to atmospheric datum, presumably due to the partial re-evaporation of some of the hydrocarbons which had been precipitated. The main point, however, is that almost the whole gas can be discharged at a practically constant calorific value, and this value is 10 per cent lower than before compression.

There was no opportunity of determining, under existing conditions, the effect on calorific value resulting from compression to 20 atmospheres; but from observations made some seven years ago, it was found that the deterioration due to compression to 300 lb. per square inch was from 3 to 4 per cent, so that if due allowance is made for the difference in constitution of the gas at the present day the effect of compression would be almost negligible. Compression, moreover, has its advantages, for up to 20 atmospheres the gas would deposit 95 per cent of its normal water content, and, as in practice it would have very little opportunity of taking up further moisture on its release from the storage cylinders, it would be employed practically dry. In this way the avoidance of dilution with water vapor would counterbalance the loss of calorific value due to the deposition of hydrocarbons.

Hydrocarbons Precipitated

As regards the hydrocarbons thrown down by compression, there is no doubt that naphthalene will be precipitated; but observation shows that there in invariably a sufficiency of liquid constituents to prevent the naphthalene from assuming the solid state. These liquid constituents, however, have a tendency to polymerize; accordingly, it would seem desirable that storage containers should be fitted with drain cocks, while it would be as well if provision were made for the periodical use of a small hand-operated spraying device to facilitate the expulsion of viscid deposits. A further point in favor of moderate compression is the fact that there would certainly be a greater deposit of hydrocarbons at extreme pressures, such as 120 atmospheres, and at the same time there would be greater difficulty in cleaning out the containers. Probably it would be necessary to expel the deposited matter by means of heating, which would entail the dismantling of the vessel—an expensive matter. In time, too, the periodical heating would adversely affect the strength of the cylinders. Another point is that with compression to 120 atmospheres the containers would be smaller, while the deposits would be greater than at 25 atmospheres, so that the volumetric capacity of the cylinders would suffer serious diminution unless they were frequently cleaned.

The British Commercial Gas Association equipped a special car for gas-consuming purposes, and carried out experiments in this way. The car was run round a district having about the average kinds of roads and variations of level, and the observations made indicate a radius of action of twenty-five miles per thousand cubic feet of gas. The average speed was nine miles per hour, including the stopping and slowing down, which was several times necessary at crossings, etc., but which is, of course, consistent with everyday conditions. It was not found possible to make comparative brake tests as between gas and gasoline, but tests made by Messrs. White and Poppe of Coventry show that the brake power developed by a gasoline motor when driven by gas is about 85 per cent of the power developed by gasoline, and that this proportion is fairly constant over a wide range of speeds; also for equal brake power on test bench, one gallon of gasoline appears to be equivalent to 250 cu. ft. of gas. These tests were made with gas compressed to only a few inches; but so far as the data of relative power are concerned, there is no reason for doubting that they apply equally well to gas that has been compressed, making due allowance for loss of calorific value due to compression, which, however—as has already been pointed out—may be regarded as negligible for pressures not exceeding 25 atmospheres. The committee's own observations, derived from general running of a vehicle on gasoline and gas, point to a ratio less favorable to gas, namely, that one gallon of gasoline is equivalent to 300 cu. ft. of gas. Much, however, depends upon the quality of the gas and the kind of

gasoline used. Several particulars are given with regard to the weight of the cylinders, and it is shown that compression to 120 atmospheres would mean a tangible economy in this direction. There is always the fact, however, that the high-pressure cylinders work at a lower factor of safety, which in turn necessitates a degree of supervision which seems scarcely practicable with reservoirs used for the storage of gas for motor traction. Moreover, the extreme high-pressure cylinders are more expensive per 1000 cu. ft. of free gas than are cylinders for the more moderate pressure of 25 atmospheres; but this item, on the other hand, would soon repay its cost by the higher carrying capacity of the vehicle, due to the smaller deadweight.

Charging Depots

So far as the equipment of compressing and storage depots is concerned, it is recommended that the station units should, for economical as well as mechanical reasons, be of the multiple type rather than in the form of a single reservoir, and should be worked at a pressure rather higher than that required on the car, so as to compensate for the drop of pressure that would take place when the gas was transferred. If when the pressures in the car cylinders and the station storage cylinders had adjusted themselves, this pressure was below the working pressure for the car, direct communication with the compressor would allow of the necessary addition being made. A suitable arrangement of valves would permit of this being quickly done. If the compressor were not supplemented by a certain amount of storage capacity in the form of auxiliary reservoirs, it would have to be of such size as to permit a car to be replenished in, say, five minutes, which would mean a compressor of 12,000 to 18,000 cu. ft. per hour capacity, and, unless the demand for gas were high, this would add unduly to the standing charges, and, therefore, to the cost of compression.

No trouble has been experienced in the reduction of temperature consequent upon the expansion of the gas after release from the storage cylinder. The gas was observed to chill immediately after release, but nothing else; the conductivity of the metal surroundings being sufficient to make up for the absorption of heat due to the expansion of the gas.

A point in favor of coal gas which must not be overlooked is the extremely clean conditions which prevail with its use. Gasoline certainly possesses the immense advantage of containing a large amount of energy in a small space; but coal gas, on the other hand, being for all practical purposes a "perfect gas" and not a vapor, conduces toward clean pistons and cylinders, absence of troubles due to injector stoppage, and the complete elimination to starting difficulties in cold weather. As the gas supplies in different parts of the country are not standardized, either as regards quality or price, the gas obtained in some localities will give a better mileage than that obtained in others; the gas equivalent, however, is unlikely ever to be higher than 300 cu. ft. per gallon of gasoline, but it may be as low as, or even lower than, 250 cu. ft.

Points on Electric Japanning Ovens

IN recent years great strides have been made in reducing the time required for japanning operations. Work that formerly took from five to nine hours is now completed in half an hour to one hour, and even better speeds are expected, especially with the electric oven. The heating units of this oven consist in general of a framework of steel or cast iron, supporting insulators made from mineral compounds, which afford high insulation resistance even at the fusing point of the metal resistor. This resistor is usually a nickel chrome alloy, manufactured as a flat ribbon which is wound continuously around two insulators, thus forming one heating unit. It is non-corrosive in air at 1500 deg. Fahr., but in japanning ovens the air seldom reaches a temperature above 600 deg. Fahr. Practice has shown that it is best, where a number of these heaters are connected, as in ovens, to use steel busbars and to have all connections mounted on insulators having the same characteristics as the heat insulators. The complete heater usually runs in units of from 2½ to 10 kw., which may be placed anywhere on the walls or floor of an oven until practically a uniform temperature is obtained throughout. This leads to high quality finish and speed, together with duplication of work, both as to quality and time. Microphotographs taken of japanned pieces, where the same grade of metal was covered by the same grade of japan in the same room, one man performing all the operations, show that the higher the proportion of heat by radiation and the less by convection the higher is the quality of the work. The second coat baked electrically is superior to a third coat of the other type.

Control Temperature to Fine Limit

The control of temperatures in japanning is most essential, especially where it is desired to insure uniform production of duplicate parts. Electric control is of two kinds, hand and automatic. Hand control involves the use of numerous switches, so connected with the heating elements that the desired number of heaters to produce or hold a given temperature can readily be thrown on or off. This is a cut and try method, but in several instances is giving satisfactory service. Automatic control involves the use of a capillary tube thermometer that actuates a contact maker through a relay, throwing off part or all of the heaters when the oven reaches the desired temperature, and again throwing in these heaters when the temperature falls. The bulb or sensitive member of the thermometer is usually about 15 ft. in length, and it is immersed inside the oven. The extension of this tube outside the oven is armored and is made of sufficient length to locate the instrument properly. A liquid that vaporizes at a temperature slightly above ordinary atmospheric temperature is the actuating medium. The instrument has two indicating hands, which are set at the maximum and minimum temperatures desired.

Radiation Gives Greatest Loss

The principal heat losses of a japanning oven are losses due to radiation from the oven, losses due to ventilation and losses due to absorption of heat by the work, together with all parts within the oven. The less the radiation and ventilation losses from the oven the greater is the amount of heat available for actual work. As a result the oven walls, floor and roof should be constructed of a high-grade heat insulating material and should have little mass, in order to keep its heat absorption as low as possible. A 4- to 6-in. wall lined with diatomic earth or similar products seems to meet the requirements. Furthermore, as little "through" metal as possible should run from the inside to the outside of the oven. The thermal conductivity of wrought iron and mild steel, as used for channel irons and bolts, is about 1400 times that of good insulating material. A ¼-in. bolt will radiate about the same amount of heat to the outside air as 7 in. square of good insulating material.

From both a baking and a safety standpoint just enough air must be brought into the oven to reduce the vapors given off by the japan to below a point where an explosive mixture is formed, but not enough to cool the oven and retard the baking. This means that for every gallon of japan baked within an oven at one time 1200 cu. ft. of free air should be taken into the oven during the vaporizing period. It has also been found good practice to distribute the ventilators in different parts of the oven. As the volatile gases liberated from the japan are heavier than air, it is well to place some ventilators where the heavy gases will be removed first.

With radiation, ventilation and absorption values expressed in British thermal units the installation of the proper number of electrical heaters becomes a simple matter, for the reason that the conversion of electrical energy into heat is a process having 100 per cent efficiency. That is, for every kilowatt-hour of electrical energy expended 3412 B.t.u. are generated.—*From a paper by C. D. Carlson read before the Cleveland Engineering Society.*

Carbon Monoxide Poisoning

Poisonous Qualities of the Gas When Present in Small Quantities —Symptoms of Chronic Poisoning—Effect of the Gas on Blood Cells

A REPORT on carbon monoxide poisoning in the steel industry has recently been published by the Bureau of Mines, Technical Paper 156. As carbon monoxide poisoning also occurs in other industries and in buildings where exhaust gases from explosion engines may accumulate, some of the remarks of the author of the report, J. A. Watkins, should prove of interest to our readers. In the report attention is given primarily to the liability to chronic poisoning—that is, the daily exposure of employees to small quantities of this gas over an extended period of time, rather than to that of acute poisoning.

As an Industrial Poison

From the viewpoint of the physician interested in occupational diseases, or of the industrial hygienist, carbon monoxide is the most important of the poisonous gases. This gas occurs so frequently either as a product or as a by-product of many industrial processes that those employed in or around such processes may be, and often are, exposed to its action. The presence of this gas in a place where men are at work, even though it be confined to the interior of manufacturing appliances and equipment, is a hazard, for experience has taught the difficulty of preventing leaks and the serious and rapid results that follow inhalation.

Knowledge derived from both practical and scientific work has been utilized with success in many instances in devising ways and means of reducing the hazard from carbon monoxide. In this connection may be noted the excellent results that have been obtained by the safety-first propaganda which is now well organized and in force in nearly all industrial institutions. However the use of gases with a relatively large carbon monoxide content and the occurrence of this gas as a by-product of many industrial processes, coincident with a general industrial development, have markedly increased in late years. As a result, while the carbon monoxide hazard is minimized in one process, new and constantly changing conditions arise which present additional hazards of poisoning.

Introduction of Blast Furnace Gas Engines a Factor

In no industry have such changeable conditions been more marked than in the steel industry. For example, the gas from blast furnaces was formerly allowed to escape as a waste product; it is now collected and utilized in the production of steam and motive power. The increasing use of gas as a fuel at steel plants, as in open-hearth furnaces, has led to its extensive manufacture in gas producers. Thus another source of carbon monoxide has been added. In addition, new processes of manufacture offer the hazard of carbon monoxide poisoning. For example, industrial advancement created a demand for many grades and qualities of steel, and this led to the use of special furnaces. Also, there arose a large demand for refractory materials for use throughout steel plants and, among other hazardous processes, the preparation of dolomite for such use appeared. Another industrial change of equal hygienic importance was the gradual substitution, especially in the steel industry, of the gas engine for the steam engine. In a modern steel plant one sees large buildings housing many engines which utilize gas having a large content of carbon monoxide. This use involves certain hazards to those concerned in transmission of the gas from the blast furnaces and its utilization at the engines. Not in steel making alone but in nearly all industries the hazard of carbon monoxide poisoning is increasing with the general technical advancement of industry.

In discussing the cumulative effects on men of carbon monoxide inhaled in small quantities (that is, quantities insufficient in amount to cause rapid and complete collapse by "gassing") daily and over extended periods of time, there should be borne in mind the following factors: (1) That the factor of individual resistance enters largely into the results, some individuals withstanding much larger amounts than others; (2) that man has some power of resistance to small quantities of carbon monoxide, as his bodily mechanism adjusts itself for a short time to such abnormal conditions by means of that reserve power with which all vital tissues are endowed. This does not mean that man is not affected by or is immune to carbon monoxide, but merely that because of physiological adjustment he does not become sufficiently ill or have symptoms serious enough to bring about his incapacitation. Such a state of affairs may be likened to alcoholic intoxication. The body, because of continued use of alcohol, may after a time be able so to adjust itself that the symptoms of poisoning are not of sufficient intensity to incapacitate the individual. Such a physiological adjustment is shown in one accustomed to drinking daily a quantity of alcoholic beverages, or a toper. To say, however, that alcohol had no longer an injurious effect upon such an individual would be incorrect. On the contrary, continued intoxication by small amounts over an extended period of time is more injurious than a single overwhelming dose, provided, of course, death or mortal injury does not ensue. The end results of both forms of carbon monoxide intoxication are the same, that is, total or partial incapacitation of the worker. The only difference between the two is in the time required.

Symptoms of Carbon Monoxide Poisoning

One of the earliest symptoms complained of by those daily exposed to small quantities of carbon monoxide is persistent and distressing headache, accompanied at times, when the headache is severe, by nausea and vomiting. A peculiar feature of this symptom is that headache often does not begin until some time after exposure, that is, after the employee has left work, but in most instances it affects the individual the whole time he is at work, becoming more severe as the day wears on. Attacks of giddiness are common and employees so affected lose control of their limbs, and frequently stagger, muscular weakness and lack of co-ordination ensue, and the individual becomes rapidly fatigued. Derangements of digestion are common, nausea and vomiting being an early symptom, and occasionally diarrhea is complained of.

A most serious effect of carbon monoxide is that which it has on the heart. Palpitation and distress about that organ are common complaints. Although dilatation of the heart may be found at times, the principal effect is upon the nervous mechanism controlling heart action. The pulse is irregular, sometimes slow, sometimes fast, and the slightest exertion markedly increases its irregularity.

Displaces Oxygen Content of Blood Cells

Because of its marked affinity for the hemoglobin of the blood, carbon monoxide quickly displaces the oxygen content of the red cells. The blood is then deprived of much of its oxygen-carrying power and the tissues in turn are deprived of this vital factor in their nourishment. After continued exposure anemia generally ensues, which, in some instances, is marked and resists treatment.

More rarely the effects of carbon monoxide are manifested by nervous disorders. These are sometimes peripheral and at other times central in character. Neuritis with ensuing paralysis, or mental derangements, such as melancholia or hallucinations, may occur. The presence of albumen or

sugar in the urine is said to be not infrequent in the course of chronic carbon monoxide poisoning.

In short, carbon monoxide is a gas of such marked toxic effect that, depending on variable factors, such as the resistance of the individual and the quantity of gas inhaled, it is only a question of time until the exposed individual is not only incapacitated for duty but may have his health impaired beyond recovery. Another fact, of consequence to employers, is that carbon monoxide poisoning renders the worker, though still on duty and not incapacitated, below par physically and also in efficiency. His mental alertness and judgment, as well as his muscular strength and co-ordination, are impaired. While in this condition he is unable to perform his duties to the best advantage of his employer.

Tractor Standardization Progress

Work Is Being Done on Magneto Couplings, Power Belts and Drawbars—Next Meeting to Be Held in Minneapolis Early in December

A MEETING of the tractor division of the S. A. E. Standards Committee was held at Chicago during the early part of this month, but was rather poorly attended. In the absence of H. L. Horning, chairman of the division, E. R. Greer took the chair. An offer of co-operation was made by the Standards Committee of the American Society of Agricultural Engineers, the tractor division of which is made up of J. F. Max Patitz, chairman, Allis-Chalmers Co., Milwaukee; L. W. Chase, University of Nebraska, Lincoln, Neb.; F. C. Glover, Emerson-Brantingham Co., Rockford, Ill.; Raymond Olney, *Power Farming*, St. Joseph, Mich.; and W. F. McGregor, J. I. Case T. M. Co., Racine, Wis. The tractor division of the S. A. E. Standards Committee expressed its appreciation of the offer and asked that the council give the matter favorable consideration.

E. R. Greer was appointed chairman of the sub-committee on punching of driving wheels. He will write tractor manufacturers for drawings and suggestions, tabulate the answers and submit recommendations at the next meeting. No report was made by the sub-committee on specification forms. The plan is to draw up two specification forms, one condensed and the other complete.

Impulse Magneto Couplings

In regard to impulse magneto couplings the opinion prevailed that the dimension from the large end of the magneto taper to the end of the engine drive shaft was not the important figure, but rather the distance from the large end of the magneto shaft taper to the center of the nearest set of magneto hold-down bolts. The vital dimension for the impulse coupling is the distance from the large end of the magneto shaft taper to the magneto face. It was arranged that Fred Glover and C. M. Eason should hold a conference with representatives of magneto manufacturers making magnetos with impulse starters, at Chicago on Oct. 13. Representatives of the following companies were invited to attend: Sumter Electrical Co., K-W Ignition Co., Byrne Kingston & Co., Heinze Electric Co. and Remy Electric Co.

Joseph Van Blerck of the Van Blerck Motor Co. was appointed chairman of the sub-committee on connecting rod bearings. Mr. Hanks reported that he had conferred with a number of belt manufacturers in New York concerning standard widths of power belts for transmitting different horsepowers at the standard belt speed of 2600 ft. per min., and that Mr. Poucher of the Chicago Belting Co. had prepared for consideration the following table of thicknesses and widths of belts required to transmit different horsepowers. Comments on this table were invited.

Belt Widths for Farm Machinery

Horsepower ...	12	16	20	24	25	30	32	36	40	48	50
Belt width in in.											
4-ply	3	4	5	6	6	7	8	9	10	12	
5-ply			4	5	5	6	7	8	8	10	12
6-ply					4	5	5	6	7	8	10

The above table applies to rubber or canvas stitched belting having a velocity of 2600 r.p.m.

For 4-ply belting do not use pulleys less than 8 in. diameter; for 5-ply belting not less than 10 in. diameter, and for 6-ply belting not less than 12 in. diameter.

It will contribute to the operating condition to use pulleys of as large diameter as practical to secure the accepted velocity of 2600 r.p.m.

It is desirable and a good practice to favor width instead of thickness, except that 4-ply belts should not be used wider than 12 in.

E. R. Greer submitted a sample and a blueprint of a forged drawbar and informed the meeting that four other samples had been made and would be sent for tests to the Allis-Chalmers Co., Minneapolis Steel Machinery Co., Emerson-Brantingham Co., and the Committee on Research and Data of the Minneapolis Section.

Committee on Steel and Shafting Sizes

A new committee on steel and shafting sizes, with W. J. McVicker as chairman, was appointed and was instructed to:

(a) Arrange for as few steel specifications as possible to cover the tractor field, and wherever possible use S. A. E. specifications.

(b) Arrange for as few shapes and sizes of both hot and cold rolled steel as would cover the field.

It was the opinion of those present that S. A. E. six spline shafting to slide when not under load can be used in all cases, and that the dimensions already standardized (S. A. E. Handbook, Vol. I, sheet 75, column 6B) be the size of the broached hole; also that the shafting should be milled to fit on the top of the key when desired, or to fit at the bottom of the spline when used for case hardened gears. A table is to be made out giving the size shaft to fit the broached hole.

A committee, of which A. W. Scarrett is chairman, was appointed to carefully review the present S. A. E. standards to ascertain which of them are applicable to the tractor industry. A report is to be made at the next meeting of the sub-committee, which is to be held at Minneapolis on Dec. 4, simultaneously with the opening of the new headquarters of the S. A. E. Minneapolis Section.

Crowe Mechanical Fan Belt

A FAN belt that is claimed not to be affected by oil, heat, dirt or water is manufactured by the Mechanical Belt Co. of St. Joseph, Mo. It was originally evolved for use on Ford cars, but can also be used on other cars, and is said to be particularly serviceable on trucks and tractors, which require an unusually large cooling capacity. The belt is made up of three kinds of parts—wire links, sheet steel links and sole leather blocks. The wire and steel links together form an endless chain or belt and the sole leather blocks serve to lock the links together and also to give the necessary friction surface. A life of 15,000 miles is guaranteed. As the belt is ventilated, it securely grips the pulley, and there is said to be no slipping at any speed.

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Good Lamps

WITH the coming of long evenings the extraordinarily poor quality of the light given by the average automobile lamp is again brought to the attention of road users. The conventional lamp is so badly made that it cannot be focused properly, cannot give a good driving light and cannot be set to conform to the 42-in. rule without great loss of driving illumination.

For the standard military truck a special lamp was designed. It was only 6 in. in diameter, but it was thoroughly well made and capable of being focused accurately. A pair of these small lamps with 12 candlepower bulbs give a far better driveing light than 90 per cent of stock lamps, as fitted to passenger cars of medium and even fairly high price.

A really good pair of headlamps is worth $50 to any man who drives much at night. It is extraordinary that no firm has grasped this fact and that there are practically no good lamps on the market. An owner of a stock car turned out by thousands is a potential customer for better lamps than the manufacturer gave him, and he would be a very willing customer, too, if only lamp makers would go to a little trouble to popularize the idea of selling good lamps.

Good lamps made to fit the better grade of stock cars, say cars costing from $1,000 up, should provide a dealer with a real money-making winter accessory. Every dealer would be glad to sell them and it only needs to get the idea that a good light is worth money to have the goods sell themselves. Why is it that someone does not grasp this golden opportunity?

Automatic Gearing

IF the war lasts for more than another year the necessity for economy in fuel will be forced upon the attention of every user. Both coal and oil will have to be used more sparingly. Probably, after a period of unusual economy, the return to pre-war wastefulness can be avoided and will be avoided. The world over mankind has been wasteful of natural resources, and especially of fuels. There must be some end to this, unless a means is discovered for tapping solar energy, and that remains a scientist's dream.

Road vehicles of all kinds are particular sinners in fuel extravagance, the efficiency in terms of work done for thermal value of fuel burned being rarely better than 5 per cent. In other words, we get about 5 cents' worth of work done for a dollar's worth of gasoline.

Must Study Economy

It is unthinkable that this state of affairs can continue for long, and there never was a time when an improvement in economy was more needed. To get it we shall probably one day discard the present type of engine altogether, but till there is a better prime mover a great deal could be done by using the conventional motor more efficiently. Both in trucks and in passenger cars the engines in common use are far too large, and operation at part throttle is normal operation. A much smaller engine would do the work at much less cost, if only there was some means for suiting its gear ratio to the demand of the moment without conscious effort on the part of the driver.

The conventional transmission is an emergency proposition on a passenger car and it is not used on a truck for the bulk of the running. Theoretically the gear should be varying almost all the time with every change in the road resistance and every alteration in speed. The passenger car which is geared five to one could cover level ground at the same speed with an engine half the size up to 50 m.p.h. or so, and a drop to six or seven to one for a slight gradient would not be perceptible if it were automatic. The average five-passenger car weighing around 3000 lb. would be amply supplied with power by an engine of 200 cu. in. or even 150 cu. in. if the gear could vary all the way from three to ten to one.

Attempts to discover an automatically variable gear have been made frequently during the last ten years or so, but no manufacturer of prominence has ever thought it worth his while to develop one to a point where it was fit to put on the market. Auto-

matic variability can be obtained by purely mechanical means, by electrical methods and perhaps, easiest of all, by hydraulic transmission. It is only necessary to take known principles and to translate them into real automobile engineering.

Could Double Efficiency

Such a car as could be made with a minute engine and a widely variable automatic gear would have as good acceleration as the present conventional big engine machine; it might even accelerate more rapidly. It should have nearly double the fuel efficiency if the proportions are right.

Because the automobile has been a step by step development without any radical changes in principle, it does not follow that no radical change should ever be made. Steam engine practice has had big changes from type to type. From condensing engines of the Watt type we have gone to high pressure, and for some purposes from the high pressure reciprocating engine to the turbine. Meanwhile the internal combustion engine has appeared as an alternative source of power and the whole history of electricity has been created.

We have been somewhat contemptuous of economy in the past, but we are not going to be in the future. Economy is going to be practised from now on, and on a scale which is scarcely yet realized. Thus this should be the time to start on the task of improving the efficiency of road transportation.

Determining Gear Ratios

THERE has been a good deal of engineering discussion as to how the different steps in a transmission should be proportioned. Something not far from a geometric progression is often used, but theories have been advanced in support of other schemes.

An idea which appears very reasonable has been suggested by John Younger, chief engineer of the truck department of the Pierce-Arrow Motor Car Co., which is that the steps between one gear and another should be in proportion to the average gradients of the district in which the machine is to operate. For example, suppose 80 per cent of the roads in a given district have no gradients worse than 5 per cent, a truck might be geared on high to tackle a 5 per cent grade. Suppose that 10 per cent of the roads in that district were between 5 and 10 per cent grade and the highest intermediate gear should be such as to enable the truck to climb a 10 per cent grade. In a three-speed transmission the lowest gear would then be an emergency, but if there were four speeds there might be a second intermediate suitable for grades up to 20 per cent.

Means Several Gearsets

This would mean that a truck going to a very hilly district might be best suited by quite a different series of gears than one going to a flat part of the country, quite apart from any difference in the high gear. In other words, suppose a high gear of 8 to 1 is satisfactory for northern Ohio and a 9½ to 1 for Pittsburgh; it does not necessarily follow that the same gearbox ratios on the indirect gears would be equally suitable in both localities.

Younger puts this forward as a suggestion and not as a conviction. Of course for a passenger car a little accuracy in an indirect gear ratio is unimportant, but with a truck, particularly a truck working in a place where steep grades are common, a mistake in choosing the indirect ratios can easily mean that needlessly great distances might have to be driven on low. By having an intermediate a little too high to suit the average gradient conditions of the district its usefulness would be reduced; and of course the extent to which the indirect gears are employed is directly reflected in gasoline and oil consumption besides cutting down the speed of the truck to some extent.

Commercial Flight

THE average Frenchman, Englishman or Italian is convinced absolutely that flying will become a commercial pursuit after the war. The average American is still inclined to be skeptical. This is the more peculiar because the benefits of communication by air would be infinitely greater in the United States than in Europe.

In point of time New York and Chicago are further apart than almost any two cities in Europe of similar importance, while New York and San Francisco are as many days apart as Paris and London are hours by the conventional kinds of transportation. Airplane mail would bring the Pacific coast as close to New York as Pittsburgh is at present. Of course it would be expensive, but the fact that telegrams cost more than letters does not prevent their use. Airplane mail should be less costly than telegraphy, probably little more expensive than ordinary mail when an air service is fully developed.

Supplies Missing Transportation Link

The airplane in a sense provides a missing link in transportation. Railroads and roads will carry any article with fair speed. The telegraph and telephone will carry nothing but speech, for a telegram cannot be a document in the way a letter may be. The airplane will not carry *any* article, but it will transport anything small and light. It can make the transmission of *documents* almost as fast as the wire makes transmission of *words*.

The importance of this cannot be overlooked. Nor is the ability of the airplane to carry passengers to be neglected. Suppose that the trip from New York to Chicago cost five times rail transport, it would still be cheap for many men on account of the time saved. The hours which the average important business man has to spend in trains are equivalent to a considerable shortening of the years of his life.

America is admittedly far behind the rest of the world in airplane development, although she has the honor of having made flight practical. American initiative ought to be able to more than make up the lost ground when the commercializing of flight is under way.

□ Latest News of the

More Preliminary Rulings on Tax

Treasury Officials Make More Suggestions on Probable Working of Tax Law

NEW YORK, Oct. 23—The Treasury Department, Washington, has made a number of additional preliminary rulings concerning the war revenue tax on motor vehicles, amplifying and otherwise explaining the rulings obtained by the National Automobile Chamber of Commerce and published last week. The new rulings do not materially alter the others.

Though these rulings, which are the result of interviews with Deputy Commissioner G. E. Fletcher of the Internal Revenue Office; E. C. Johnson, Solicitor of the Internal Revenue Office; P. S. Talbert, Chief of the Law Division, and Dr. Gilbert Brenizer of the War Tax Division, are only preliminary and subject to change, it is expected that they will prevail.

It is hoped that by the end of November when taxes must be paid, official rulings will be announced. Following are the preliminary rulings, the phrases in italics being new:

1—Manufacturers selling new cars and trucks on and after Oct. 4, 1917, pay a tax of 3 per cent on the manufacturers' selling price. This is on the price received by the manufacturer for the car and not the list price, unless actually sold for that.

2—*If the manufacturer passes the tax on, the Treasury Department believes that the price the manufacturer gets for the car should include the present price of the car plus the tax collected. For example, if the maker sells the car for $800 plus the war tax of $24, making the selling price $824 with no reference to the tax, the Government will assess the tax of 3 per cent on $824. For the manufacturer to receive the full $800, plus the war tax, his billing price would have to be $824.74, of which 3 per cent of $24.74 would be paid to the Government. The maker's price therefore would be 97 per cent of the total charge to the customer. This appears to be a tax on a tax, but the Treasury Department rules that the tax is on the gross amount the manufacturer receives and the tax is part of that amount, even though later paid over to the Government.*

3—*Wholesalers or combined wholesalers-retailers holding new cars or trucks for sale at the opening of business, Oct. 4, must pay 1½ per cent on what is paid to the manufacturer for them. However, no tax is assessed on cars or trucks sold and delivered prior to May 9, 1917, where the title has been retained as security. Dealers who do both wholesale and retail business must pay a 1½ per cent tax on all new cars held on Oct. 4 whether subsequently sold at wholesale or retail.*

4—*Used cars are not taxable, whether held by manufacturers or wholesalers.*

5—Chassis are considered automobiles and are taxed accordingly.

6—*If the manufacturer, wholesaler or wholesaler-retailer sells a taxable car or truck to a dealer under contract made prior to May 9, 1917, then no matter what the contract may say about taxes, the dealer who buys the car or truck must assume the tax and pay it to the seller, who will in turn pay it to the Government.*

7—*The manufacturers' tax accrues when the car or truck is sold, and this means when the title to the merchandise passes to the buyer, whether by the physical transfer of property or the bill of lading representing it. Therefore, the title passes when the merchandise is delivered to a carrier who is the agent of the buyer or the bill of lading is put in the mail or delivered to a bank.*

8—*A car delivered on a chattel mortgage is a sale when the title passes and not when the mortgage is paid off.*

9—Cars or trucks sold to the Government probably will be relieved from the tax, though the person making the sale must make application to the Treasury Department for an order releasing the article from the tax. Cars and trucks sold to foreign governments are taxable.

10—Branch houses, if distinct and separate corporations from the manufacturers' corporation, do not subject the manufacturer to taxes incurred by the branch.

11—Where extras are shipped with a car and make one sale the manufacturer is taxed on the full amount, but where cars are shipped standard and extras added these would not be taxed.

12—The Treasury Department does not look with disfavor on the plan of averaging the tax so that the amount paid by the ultimate buyers of a certain type of car shall be the same, irrespective of different discounts given various classes of dealers.

13—*Wholesalers should make returns on the floor tax with checks covering the proper amount before Nov. 2, 1917. The payment may be extended to a date not exceeding 7 months from the passage of the act upon the filing of a bond for the payment which must not be less than double the amount of the tax and in no case less than $1,000. Liberty Bonds are acceptable.*

14—*Manufacturers should make reports with checks for the proper amount on their October sales any time before the end of November, making monthly reports thereafter.*

—

Plan Merger of Hal and Abbott

CLEVELAND, Oct. 25—A plan has been proposed for the merger of the Abbott Corp. and the Hal Motor Car Co., both of Cleveland. Directors will meet soon to decide if the proposition shall go through. If the combination is effected the company will continue to make the Hal twelve and the Abbott six-passenger cars and will also produce a truck. The combined capitalization of the two companies is now something over $1,000,000. The Abbott Corp. moved here from Detroit, and in March this year began producing cars in its plant, 110 by 700 ft., on a 6-acre tract. F. B. Willis is president of the Hal company, Frank H. Ginn secretary and E. G. Tillotson treasurer. Alfred Thompson is president of the Abbott Corp.

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Trench Locomotives for Government

WASHINGTON, Oct. 24—It is understood the government has placed orders for an additional 42 gasoline locomotives for trench work. The name of the company receiving the order has not been divulged.

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Mutual Motors May Reorganize

JACKSON, MICH., Oct. 24—The Mutual Motors Co., maker of the Imperial and Marion-Handley cars, will probably reorganize with new capital at a meeting to be held to-day. The plant has been shut down for a period of from 30 to 50 days for inventory.

Brighter Outlook for Future

Unsettled Conditions and Not Liberty Loan Responsible for Small Buying

DETROIT, Oct. 22—In spite of the fact that new car sales, on the whole, are below normal, dealers state that the second Liberty Loan is not the cause, and that business conditions for the future look brighter. During the past week, the market on light cars has in some instances approached normal, and the medium and higher-priced cars have taken a slight upward trend. The general unsettled conditions, not the Liberty Loan, seem to have affected the buying public.

The draft, enlistment and doubt as to future plans have removed one definite group of the buying public from the prospect field. This group comprises those men between the ages of 20 and 40, who have good paying positions, and who normally would be purchasing new cars. These men do not know how long they will remain in their present positions, or how long it will be before they are in the army.

Hence the Loan can only be considered as one element in the present condition, and that now is removed, as Detroit has already oversubscribed its quota.

The new car sales are also stopped up to a great extent from the bottom—that is, there is but little market for used cars. In fact, in some cases the number of used cars on hand is so great that the dealers are refusing to make any trades involving used cars. And in several cases the dealers are preparing to make a drive on used cars in an attempt to clear the market.

The reason for this condition is evident. Many young men, in going to the training camps, have been forced to dispose of their cars at a sacrifice. It is not an uncommon sight to see a 1917 car standing at the curb, with the sign "Drafted—was $1,950—for sale, $900." This has flooded the market with used cars, supplied the normal market, and forced the dealers in many instances to lower the price on their used cars.

But in spite of these apparent indications of a poor coming season, dealers of the old line are standing pat. They have confidence in the future, and are placing orders for new cars, and are preparing for a good business this winter. They have expected that business would be different, that problems would arise, and are working harder to meet the new conditions. And where this has been done, the reports are encouraging.

Automotive Industries

Earnings of United $6.85 a Share

First Annual Report Shows Sales of $38,638,955 and a Surplus of $7,540,816

NEW YORK, Oct. 24—The United Motors Corp., in its first annual report covering the year ended June 30 last, shows a net surplus available for dividends on the 1,101,640 shares of stock outstanding of $7,540,816, equal to $6.85 per share, after deducting the normal income tax of 2 per cent and depreciation of $868,465. No allowance is made for excess profits tax. Gross sales were $34,820,526 and net sales, i. e., after allowances, returns, freight, etc., were $33,638,955, compared with $25,064,184 for the previous year, an increase of 38 per cent. Alfred P. Sloan, Jr., president of the company, in his remarks to the stockholders, says conditions more or less beyond the control of the directors necessitated the absorption of the company's earnings as working capital.

The inventories as of July 1, 1916, were $8,717,300, and as of July 1, 1917, were $14,387,734, an increase of $5,670,434, or 65 per cent. This is accounted for, partly, by the high cost of labor and material, and, further, by the inventories of the additional properties acquired. Fully 75 per cent of the corporation's inventories have been purchased against merchandise sold, so that in the event of any unusual or rapid reduction in the cost of materials the loss to the corporation will be relatively small.

The net operating income of the corporation for the year was $7,621,743. This represents 23 per cent on the net sales and is after deducting the 2 per cent normal income tax and charging off as depreciation $868,465. In addition, there has been absorbed as a part of the cost of sales for maintenance of plant and property, $1,160,752.

During the year plant additions were made by the New Departure Mfg. Co. and the Harrison Radiator Corp. At the time the United Motors Corp. was formed extensive improvements were being carried on by the Hyatt Roller Bearing Co. and the Perlman Rim Corp. The value of plant and equipment as of July 1, 1916, was $10,314,174 and as of July 1, 1917, was $13,252,757, an increase of $2,938,583. All extensions are nearly finished.

(*Continued on page 737*)

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Booth Resigns from Scripps-Booth

DETROIT, Oct. 22—Clarence H. Booth has resigned as president of the Scripps-Booth Corp., and no definite information is available as to whom his successor will be. On reliable authority it is stated that W. H. Little, at one time head of the Sterling Motor Co., is vice-president, and that the Scripps-Booth Corp. is to pass into the control of large and influential automobile interests. In the course of about 3 months it is expected that new models incorporating several radical changes will be coming through production, and that a revision of prices will be made at that time.

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PERLMAN RIM SALES IN CHARGE OF JACKSON

JACKSON, MICH., Oct. 20—The Jackson Rim Co. has decreased its capital stock from $10,000 to $5,000. This company has completed a sales agreement whereby the sales department of the Perlman Rim Corp. of Jackson has been taken over, and whereby the sales of the Perlman corporation will be conducted from Jackson instead of New York. In the future all correspondence and trade agreements with the Perlman Rim Corp. should be directed to the Jackson Rim Co.

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More Money for Harroun

DETROIT, Oct. 23 — The Harroun Motor Corp. has obtained in cash $650,000 from Kansas City interests which amount is being used for production purposes and which brings the liquid assets of the company including cash in bank and inventory up to $1,000,000. The value of the plant, real estate, machinery, etc., amounts to $1,250,000 or a total investment of $2,250,000. With this new capital it is expected to have a production of 25 cars a day within 30 days. The company has been in production since July manufacturing complete cars which have been delivered to dealers and distributers. Cars have been under test for 3 or 4 months. For some time the factory has been building motors to be ready for its production schedule which is now to be put under way. It is expected that production will be stepped up from 25 per day.

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Miniger Vice-President of Willys-Overland

TOLEDO, Oct. 25—C. C. Miniger, president of the Auto Lite Co., has been appointed a vice-president of the Willys-Overland Co., effective Nov. 1. Mr. Miniger will devote his time to assisting Mr. Willys in the general management of the Overland business. The Elmira plant of Overland is working night and day on airplane work and is employing 4000 men.

Old Studebaker Plant for Essex

3-Year Lease Taken—Hudson Dealers Applying for Agency for New Light Car

DETROIT, Oct 22—The Essex Motor Co., which was recently incorporated by officials and stockholders of the Hudson Motor Car Co. for the purpose of manufacturing a light car, has taken a 3 years' lease on the old No. 5 Studebaker plant. This building fronts on Franklin Avenue and is approximately 200 by 200 ft. It has three stories and about 60,000 sq. ft. of floor space.

It is expected that the plans and specifications of the new Essex car will be announced in a few weeks. Already Hudson dealers throughout the country are making applications for agencies and contracts.

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Willys-Overland's New Car Ready Next Summer

TOLEDO, Oct. 20—The new light model of the Willys-Overland car, announced in a previous issue of Oct. 4, will not be in the hands of the public until the summer of 1918. The car is designed to be produced in quantities, and because of the peculiar difficulties of the time, in getting material and machinery, the delay in getting into production is necessitated. As it will be a small car, in the low price class, there will be no interference or competition with the present models, and it will meet an entirely different demand.

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Willys-Overland Prices Will Be Higher Oct. 31

TOLEDO, Oct. 24—The Willys-Overland Co. has to-day announced its new schedule of prices, effective Oct. 31. Prices rose from $20 to $35 on Oct. 3. The Model 90 price went up $20; Model 85-B4, $25; 88-4, $35; 88-8, $35, and Model 89, $25. The new prices are as follows:

Model	New Price	Old Price
90 Roadster	$780	$735
90 Touring	795	750
Country Club	840	795
90 Sedan	1240	1195
85 Touring	930	895
85 Roadster X	915	880
85-6 Touring	1130	1095
85-6 Roadster	1115	1080
85-6 Coupe	1420	1385
85-6 Sedan	1620	1585
89 Willys 6 Touring	1365	1295
89 Willys Club 6	1365	1295
89 Willys 6 Sedan	2045	1875
88-4 Touring	1525	1450
88-8 Touring	2000	1950
88-8 Sedan	2700	2650
88-8 Limousine	2800	2750

Class B War Truck Contracts Nov. 1

Orders Already Placed for Parts for 10,000 Trucks—Delivery in January

WASHINGTON, Oct. 23—All contracts for the new heavy-duty class B war trucks will be placed by Nov. 1, according to the present plans of the quartermaster's department. Already orders for axles, motors, transmissions and steering gears have been placed for 10,000 trucks, and the remaining contracts will be let shortly. The trucks are purchased by the quartermaster's department working in co-operation with the War Industries Board. The director of military truck production department arranges with all makers of a specified part for a conference, and at this conference the form of contract is discussed and specifications detailed. The board then turns all available information over to Brigadier General Chauncey B. Baker, who places the actual contracts following the submission of bids by parts makers. It is expected that the first delivery of trucks will commence in January and that 10,000 will be completed by June or July.

"Parts makers," says General Baker, "have been willing to sell the government at the same terms on a single order as they receive from large companies buying on long-term contracts, and if the patriotism of the industry is to be judged by the attitude of these parts makers, it would be 100 per cent."

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Jordan Sold 1788 Cars in Its First Year

CLEVELAND, Oct. 20—The Jordan Motor Car Co., which started production in September, 1916, has made its first annual report. During the first year it sold 1788 cars at a valuation of $3,189,600. This was accomplished on a working capital of $300,000. The Jordan company has on hand a sufficient number of orders for immediate delivery to keep the factory going at top speed for at least 60 days.

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Maxwell 1918 Truck Prices Increased

DETROIT, Oct. 22—The Maxwell Motor Co. has increased the prices of the Maxwell truck for 1918, has added a new body style and made two slight mechanical changes. The prices are now $865 for the chassis and $995 for the screened express body. The prices were formerly $760 for the chassis and $845 for the screened express. The Maxwell truck body line is now standardized so that it is possible to build up practically any kind of a body by means of the combination box and stake types whereby the stakes are set up inside the flare on the box body. The complete line of bodies now embraces four types by means of this standardized form of design, the express canopy at $995, combination box at $915, combination box stake at $950, and the stake gate body at $955. The chassis with cab and windshield is $900.

The mechanical changes are slight, being merely an increased volume of cooling area and a change in the reduction on low gear. This has been raised to 34 to 1, whereas it was formerly 21 to 1. The new reduction allows of considerable more power application for handling heavy loads in hilly country.

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Stephens Price $100 Higher

CHICAGO, Oct. 20—Oct. 25 the price of the Stephens Salient Six will be increased from $1,385 to $1,485.

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Dodge Bros. Up $50 to $85

NEW YORK, Nov. 19—The new prices of Dodge Bros. roadster and touring car are $885, and the sedan and coupé, $1,350. The prices are effective Nov. 1. This is an advance of $50 on the open, and $85 on the closed models.

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Cleveland Show Jan. 19-27

CLEVELAND, Oct. 17—The seventeenth annual automobile show will be held from Jan. 19 to 27 in the Wigmore Coliseum. Two years ago Cleveland inaugurated the plan of holding a show through two Sundays, and this will be continued again this year. The Cleveland show is held by the Cleveland Automobile Show Co., a dealers' organization, with the co-operation of the Cleveland Automobile Club.

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Moline Price Increase Nov. 10

EAST MOLINE, ILL., Oct. 20—The Moline Automobile Co. will raise its prices Nov. 10. The Moline-Knight Model C touring cars and roadsters will be raised in price from $1,495 to $1,575. The model G touring cars and roadsters will be raised from $1,840 to $1,950.

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Chalmers Increase Nov. 1

DETROIT, Oct. 20—The Chalmers Motor Co. will increase its prices Nov. 1. The five-passenger touring and the roadster will be increased from $1,250 to $1,365. The seven-passenger model will be increased from $1,350 to $1,450. The new prices include the war tax of $30.

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Wright-Martin Gets Government Order

NEW YORK, Oct. 23—The Wright-Martin Aircraft Corp. has received an order from the United States Government for 500 150-hp. and 4000 220-hp. Hispano-Suiza airplane motors. The company is at present manufacturing this type of motor for the French Government under license. The order for 450 of these motors placed by the French Government 2 years ago has not yet been completed, but it is expected that it will be finished by the end of this month, when the company can turn its attention to the United States Government's initial order for the 150-hp. motors.

Hydraulic Steel Adds Canton Company

$4,000,000 Involved in Deal—Will Consolidate All of Its Interests

CLEVELAND, Oct. 20—The Hydraulic Pressed Steel Co. has acquired possession of the Canton Sheet Steel Co. of Canton, Ohio, thus gaining control over its product from the raw steel to the finished form. An amount of $4,000,000 is involved, half of which will be paid in cash. The Hydraulic Pressed Steel Co. plans later to consolidate all of its various interests including its subsidiary, the Cleveland Welding & Mfg. Co.

The officers of the Canton Sheet Steel Co. will be J. H. Foster, president; C. A. Irwin, vice-president and general manager; H. S. Renkert, second vice-president; H. H. McIntosh, Jr., treasurer, and S. H. Tolles, secretary. Mr. Foster is also president of the Hydraulic Pressed Steel Co. Mr. McIntosh is an official of the Guardian Savings & Trust Co., Cleveland, and Mr. Tolles is a prominent Cleveland attorney. Five Cleveland men go on the Canton board, Foster, McIntosh, Tolles, A. W. Ellenberger and E. I. Heinsohn. C. A. Irwin, W. W. Irwin and H. S. Renkert are the Canton men who will remain on the board and C. A. Irwin, founder of the Pressed Steel company, will continue in active charge.

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Rival Companies Plan Airplane Race Across Atlantic

NEW YORK, Oct. 20—A transoceanic airplane race will be held next spring, if the plans of the Handley-Page Co. of England and the Caproni company of Italy are carried out. Rivalry between these two companies for the honor of sending the first flying machine across the Atlantic has caused both companies to take great interest in the feat.

The Handley-Page Co. has sent officials here to plan the trip. The Caproni company has already announced that it will send a machine on the long voyage and has made several spectacular flights in this country with the type of machine it purposes using on the transoceanic trip.

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Detroit Starter and Ward Leonard Arrange for Exchange of Patents

DETROIT, Oct. 19—The Detroit Starter Co. has made arrangements with the Ward Leonard Co., New York, for exchanging of patents and for a closer working relation. In the future all subsequent electrical systems will be equipped with the Ward Leonard controllers. The Detroit Starter Co. manufactures Genolite lighting systems and the speedorator for Ford cars. H. Kirk White is secretary-treasurer and attendant with the above changes the factory is being expanded to care for an increased output.

Detroit's Quota Is Oversubscribed

Over $43,000,000 on Liberty Loan Taken, Mostly by Makers

DETROIT, Oct. 20—This city is among the first to oversubscribe its official quota of $43,000,000 on the Liberty Loan, and in no small part is this due to the automobile manufacturing interests in the city. The workmen themselves, exclusive of the factories as institutions, have subscribed from $75 to $100 per man. In shops of over 500 employees, a total of 105,000 men, $5,019,850 has been subscribed, and the 220 smaller shops have turned in a total of $2,000,200 to date.

The following tabulation shows the amounts contributed by some of the automobile concerns, those in some cases showing the totals contributed by both factory and employees, others simply that contributed by one or the other:

Henry Ford (Personal)	$5,000,000
Ford Factory	3,000,000
Cadillac	400,000
Morgan & Wright	214,600
Continental Motors	120,000
Timken-Detroit	431,000
Paige	100,000
Packard	1,500,000
Zenith Carbureter	30,000
Hudson	38,000
Detroit Steel Products	174,000
Detroit Copper & Brass	150,000
National Twist Drill	300,000
Water Marine Motors (Receivers)	3,400

A standardized plan for soliciting in the shops was formulated by the Liberty Loan Committee, and in those cases where the factory co-operated nearly every employee subscribed $100. By this plan meetings were held for all of the men, the foremen became salesmen for their group, and the factory employees underwrote all subscriptions. A petition form was used, so that each man in the group could see how much his fellow-workman had subscribed.

Large Government Contracts

Not alone in money is the automobile industry standing back of the Government. It is now estimated that the Packard Motor Car Co. is engaged on Government contracts amounting to $60,000,000 on the basis of cost and 10 per cent. Dodge Brothers are doing similar work amounting to $7,000,000 on the same basis, and the Ford Motor Co. and many others are engaged on an amount of work that cannot be discussed. Detroit automotive interests in a large extent are furnshing the brains and the means to move the armies. And they are doing this in an unselfish manner, as it can only be done at a sacrifice to their normal output.

Joy and Ford for France

To-day it is reported on reliable authority that several men prominent in the industry have been called to serve in the business administration department of the Aviation Corps in France and will leave at an early date. These are the first of twenty-five that will be sent from the various parts of the country. Among them are H. B. Joy, formerly of the Packard Motor Car Co.; Angus Smith, at one time with the Olds Motor Works; H. W. Ford of the Continental Motors Corp., and Jack Dayton.

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New York Subscriptions Heavy

NEW YORK, Oct. 22—Liberty Loan subscriptions by the leading automobile makers are reaching large figures, according to the latest figures. General Motors this week has contributed $1,500,000; United Motors, $1,000,000 and Chevrolet $500,000. The local dealers, representing the automobile and allied trades, have contributed about $1,500,000.

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May Pay Taxes with Liberty Bonds

WASHINGTON, Oct. 23—The Commissioner of Internal Revenue has ruled that where additional taxes are imposed by the war revenue bill of Oct. 3, 1917, upon articles or commodities, upon which the tax imposed by existing law has been paid, the person, corporation, partnership or association required to pay the tax shall have the privilege upon the filing of a bond as required by law, for the payment of such taxes, of depositing Liberty Bonds of the United States in lieu of other security for such payment.

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Willys Plans War Recreation Campaign

WASHINGTON, Oct. 24—John N. Willys, who is giving his services to War Camp Community Recreation, was chairman of a meeting attended by representatives from all parts of the country, which was held in Washington, beginning Oct. 23, at which plans for a campaign for furnishing leisure hour entertainment for soldiers were made. The national committee, with Mr. Willys as chairman, will direct the work decided upon.

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Empire Automobile Plant Offered

INDIANAPOLIS, Oct. 20—L. V. Cram, engineer for the Empire Automobile Co., returned from Washington to-day, where he went to offer the government the use of the company's factory. Mr. Cram said that although the company has plenty of orders for automobiles to keep the plant busy, the company had offered the use of the plant for patriotic reasons. The company proposed to manufacture machine gun and ammunition carts for the army.

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Russel Adds New Capital

DETROIT, Oct. 20—The Russel Motor Axle Co. has increased its capitalization from $600,000 to $750,000.

The company has just completed a one-story addition to its plant which gives additional floor space of 26,000 sq. ft.; $50,000 of new machinery has just been purchased which will enable the company to increase its production 60 per cent during its next fiscal period over what it has been during the year just closing.

No Tires to Be Had in Germany

Kaiser Only One Using Pneumatics—Gasoline $6 a Gal.—Government Permits

NEW YORK, Oct. 20—The Kaiser is the only one in Germany using pneumatic tires, according to Victor Van der Linde of the B. F. Goodrich Rubber Co., who has just returned from a tour of Europe. No tires are obtainable in Germany and Austria. In Holland they cost $350, in Spain $125, in Russia and Italy $100, and in England and France $90.

German scientists have tried to improvise for the scarcity of rubber by compounding what they call synthetic rubber, said Mr. Van de Linde. But in this they have been unsuccessful. There is not an ounce of crude rubber in Germany, and therefore it is devoid of fiber. This synthetic rubber has cost about fifteen times more a pound than the vegetable.

The situation of both Germany and Austria in regard to tires is deplorable. Countries bordering the Central Empires, with the exception of those that are at war with them, are in just as bad plight.

Most casings are stuffed with compressed champagne corks, paper, rags and sausages made of ground cork.

Some have even been filled with sand and dirt. This only refers to those cars that have ragged casings left. Most automobiles have ground away their shoes and move about on rims bound with rope. There is not one bicycle tire left in Germany outside of those on military bicycles. Raids by the wholesale were conducted on shops and residences, and all bicycle tires seized. In fact, everything in rubber has been reclaimed for tire construction and submarine battery cells.

Gasoline is as big a problem as tires, according to Mr. Van der Linde. In no country can it be had without government permit, and in Germany prices are practically prohibitive.

An automobile trip of 200 miles in Germany would cost the average German $200 in gasoline alone. Gasoline costs the German and Austrian $6 a gallon, the Hollander $1.50, the Frenchman $1.25, the Spaniard $1.10, the Italian $1 and the Englishman 95 cents.

Spain has taken advantage of its neutrality to build up a big automobile industry, and has built truck haulage systems equal to our railroads. Shortage of railroad equipment forced Spain to adopt the truck as the chief means of travel.

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Laurel to Build 16-Valve Motors

INDIANAPOLIS, Oct. 20—The Laurel Motors Corp., Anderson, has purchased the Roof sixteen-valve head motor invention and will erect a large plant as soon as possible. Breaking ground for the plant will be started in the near future.

Movement Against A. A. A. Revealed

Attempt Made to Form Organization to Control Speedway and Other Motor Racing

UNIONTOWN, PA., Oct. 20—An attempt to form an outlaw association to control motor racing on certain so-called speedways in the country came to light here at a meeting held preliminary to the races to be held on the speedway here today, but which were postponed for a week, because of bad weather. In the motive is unquestionably a carefully thought out plan to overthrow the Contest Board of the American Automobile Association, which has sanctioned speedway racing and other motor racing since the inception of the sport.

The proposed outlaw organization known by the high-sounding and misleading name, "National Grand Circuit of American Speedways," while purporting to have submitted its plans to many of the speedways really did not do so, and so brands itself as an individual effort on the part of one or two to get hold of many unsuspecting drivers, who have already, it is reported, signed contracts for the 1918 season with the outlaw organization.

While the outlaw organization came to the surface at the meeting here, it is well known that it was conceived in another part of the country and it is not the conception of anybody in Uniontown. It was known more than a week ago that such a movement was under way, and such major speedways as Indianapolis, Chicago, Cincinnati and Providence agreed to have nothing to do with such an outlaw organization and to stand by the Contest Board of the American Automobile Association. This action of the speedways refutes the statement given out in Uniontown to the effect that the matter had been laid before the other speedways and had been considered favorably by them.

It is reported that 29 drivers have signed for the 1918 season with the outlaw organization, which, in the contract with these drivers, is represented by Johnson, the local speedway president. These drivers have signed away their very existence according to the contract and agree to drive for nobody but the outlaw organization during the 1918 season.

Some idea of the contract which drivers have signed may be gathered from the following brief excerpts:

The season is to begin May 10, 1918, and run to Oct. 31, 1918, and during that time 2000 miles of racing is to be scheduled. The "Grand National Circuit" is given the power to establish rules which become part of the contract, and may impose fines for violations, or suspend drivers. Rules of the A. A. A. are to be adhered to "in so far as deemed advisable."

The "Grand National Circuit" is to subscribe $50 per mile of racing, to transport all cars free of charge and to furnish two railroad tickets for each car. In case of disabled drivers, compensation will be paid "as may be prescribed in the rules to be adopted." Drivers who signed a contract are not permitted, without written consent, to participate in races not sanctioned by the "Grand National Circuit."

Among some of the more prominent drivers who are reported to have signed the contract are Andy Burt, Omar Toft, O. F. Haibe, Jack LeCain, Eddie Hearne, I. P. Fetterman, Neal Whalen, Earle DeVore, Gaston Chevrolet, Ira Vail, Thomas Milton, Pete Henderson, Gil Anderson and Dave Lewis.

Johnson states that plans have not yet matured to the point where the names of speedways, alleged to have signed his contracts, may be made public.

Canadian Ford to Manufacture Trucks—60,000 Passenger Cars for 1918

FORD, ONT., Oct. 23—The production of the Ford Motor Co. of Canada during the year ended July 31 was 50,872 passenger cars, which shows an increase of 18,181 over the preceding year. No trucks were manufactured last year, but in the coming year it is planned to produce 10,000 trucks and to increase the passenger car production to 60,000.

This increase has been made possible by additions to the plant and to the equipment. A machine shop costing $389,000, new machinery amounting to $352,000, electrical equipment to $110,000, and a factory addition costing $86,000 have been made. No further extension is planned for the coming year except for additional machinery.

The Ford Motor Co. of Canada has no connection with Henry Ford & Son, manufacturers of the Ford tractor, and this, therefore, will not be manufactured in the plant. The directors and officers will be elected as follows: Henry Ford, president; G. M. McGregor, first vice-president, treasurer and general manager; James Couzens, second vice-president; F. L. Klingensmith, third vice-president; W. R. Campbell, secretary.

Bailey Ball Thrust Bearing Replaces Flat Thrust Washer

CHICAGO, Oct. 19—The George D. Bailey Co., Chicago, has been incorporated for $25,000 to manufacture the Bailey ball thrust bearing, which replaces the flat thrust washer used as standard equipment at the left gear side of the differential on the Ford and Chevrolet 490 cars, together with the Rayfield coupling for magneto, generator and pump shafts.

The Ahlberg Bearing Co. has been exclusive distributor for the Bailey products, but Bailey now will market through jobbers and dealers direct, though Ahlberg will continue to handle the line. The officers are: President, George D. Bailey; vice-president and general manager, C. F. Ferguson; secretary, F. M. Stephan, and treasurer, E. H. Ferguson.

Taneyhill Leaves Scripps-Booth

DETROIT, Oct. 23—W. H. Taneyhill, who was general sales manager of the Scripps-Booth Motor Car Co., has severed that connection to become sales manager of the Detroit Weatherproof Body Co., Pontiac.

Cleveland S. A. E. Opens Session

Paper on Aviation First of Winter Series—Commercial Use After War Predicted

CLEVELAND, Oct. 20—At the meeting of the Cleveland Section of the Society of Automotive Engineers held here last night, E. H. Sherbondy, research engineer in the Government airplane engine service, and Alfred Harris, a Cleveland business man and amateur aviator, spoke on aviation topics. It was originally planned and announced that a noted French aviator would address the meeting on conditions at the French front as regards the aircraft service. This aviator was to be Captain De la Grange, who addressed the last summer session of the Society of Automotive Engineers in Washington. Owing to the fact that orders reached the captain which necessitated his being elsewhere that evening, the program could not be carried out, and Messrs. Sherbondy and Harris addressed the meeting extemporaneously on aircraft subjects.

Sherbondy took up the discussion of the type of airplanes now in use in all the principal countries, showing lantern slides of a large number of these and explaining the points of interest regarding each. He showed the different engine arrangements and points of difference in other features of the allied and German aircraft.

In speaking of the fuels used by airplanes, Sherbondy stated that these must be more volatile than the fuels used for automobile purposes and should have an end point not exceeding 250 deg.

Alfred Harris, in speaking of the aviator's point of view of his machine, stated that no one appreciates the value so much as the one who flies. He spoke of the desirability of having an ample reserve power factor for machines regardless of weight, because the machine having the highest power is the safest due to the increase in the safety factor with increased speed. The slower machine, he said, is particularly dangerous on curves, due to the side slipping on banking.

In regard to the length of time required to teach aviators, although it now takes 3 or 4 months, the system will soon be so perfected that men will be taught to become good fliers in 30 days.

Trustee for Detroiter

DETROIT, Oct. 23—The Detroiter Motor Car Co. is being held by the Security Trust Co. as trustee for the time being. At present an inventory is being made and the Security Trust Co. will act in its present capacity either until new capital is obtained and a reorganization effected, or until the company is sold to satisfy stockholders. Production is being continued in a limited way, about twelve cars being made in the past 2 weeks. The service organization is being maintained.

Industrial Review of the Week

A Summary of Major Developments in Other Fields

Transportation Hinders Steel Production

There has been little or no change for the better in the railroad congestion and the difficulty or almost impossibility of securing sufficient cars is still with us. Some plants have been compelled to curtail their outputs and this has resulted in the loss of good workmen, for when they have been given a lay-off because some mills were too far ahead of stock or for other reasons, they have immediately found work in other quarters.

There will be no decided improvement so far as securing cars is concerned until navigation closes on the Great Lakes. At present all classes of commodities are being rushed to the Lakes in an effort to get the products on the vessels before the severe winter weather starts.

Shipping will be continued as long as possible, and risks will be taken to operate ships probably several weeks longer than in normal times. It is estimated that Lake navigation will be kept up until at least the 10th of December, and may be continued until the 15th and possibly a few days later.

It is possible that the freight congestion will become more acute ten days or two weeks prior to the closing of navigation on the Great Lakes, when every effort will be made to rush everything to the docks, but after the middle of December improvement in the supply cars may be looked for, because those which have been in use to and from the Great Lakes will be diverted to other quarters.—*Financial America.*

A New Service

Herewith THE AUTOMOBILE AND AUTOMOTIVE INDUSTRIES *supplies for the benefit of its readers a general summary of important developments in other fields of business. This is rendered possible by the editorial cooperation of leading industrial publications which are recognized authorities.*

By compressing the general industrial situation into this form we hope to give our readers a clear and comprehensive idea of up-to-the-minute developments which they could otherwise secure only with considerable expenditure of time and effort.

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Increased Yield of Turpentine and Rosin

Naval stores operators can obtain about 30 per cent more turpentine and 35 per cent more rosin than they ordinarily get from their trees, by increasing the number of chippings during a season. This has been determined by actual experiment made by the Forest Service on a tract in Mississippi, the results of which are given in a publication just issued by the Department of Agriculture. Briefly, the method that gives the increased yields is to chip twice a week instead of once. The streaks, however, are cut only one-fourth inch high instead of the present standard of one-half inch. At the end of the season therefore the faces are no higher than when a half-inch streak is cut once a week.

Double chipping, of course, entails extra expense, but this is much more than offset by increased returns, the report states. With all additional expenses taken into account, and in the light of 1916 prices, double chipping should increase the net profits from a turpentine crop of 10,000 faces by about $450. This means an increase in net profits from a fifty-crop operation of about $22,000.

While the studies made by the Forest Service show a large increase in yields and revenue, as the result of double chipping, not enough data have been secured to show the effect of the system on the trees in the second and subsequent years. Indications during the first year are that double chipping causes a somewhat more severe drain upon the vitality of the trees than the ordinary methods. —*Forest Service U. S. Department of Agriculture.*

United Motors Earns $6.85 a Share

(*Continued from page 733*)

The income account of the United Motors Corporation and subsidiary companies for the year ended June 30, 1917, is as follows:

Gross sales	$34,820,526
Returns, allowances, discounts, etc.	1,181,570
Net sales	33,638,955
Cost of production	24,235,901
Gross profit on production goods sold	9,403,054
Gross profit on purchased goods sold	166,913
Royalties earned	589,963
Gross earnings	10,159,931
Selling and general expenses	2,401,542
Net earnings	7,758,389
Other income	416,213
Gross income	8,174,602
Taxes, interest, etc.	552,858
Net operating income	7,621,743
Amortiz. of patents, invent. adj., etc.	236,593
Net income	7,385,150
Subsidiary co.'s dividends	80,927
Final surplus	7,304,222

The consolidated general balance sheet of the United Motors Corporation and subsidiary companies, as of June 30, 1917, shows the following assets and liabilities:

ASSETS.

Plant, property and equipment		*$13,252,758
Other real estate		23,027
Good will, patents		21,558,513
Investment — stocks, bonds, etc.		590,519
Cash	$1,802,423	
Notes receivable	147,659	
Accounts receivable	3,896,986	
Sundry debtors, royalties, etc.	484,613	
Surrender value life ins. policies	25,538	
Accrued interest rec.	1,818	
Inventory	14,387,735	20,746,773
Deferred debit items.		168,019
Total		$56,339,609

LIABILITIES.

Sub. co. preferred stock		$1,091,300
1st mortgage bonds		300,000
Real estate purchase contract		312,000
Notes payable	$3,223,928	
Accounts payable	2,620,689	
Patent purchase account	318,750	
Employees' Liberty Bonds	2,039	
Accrued salaries and wages	176,225	
Accrued taxes	†244,890	
Accrued interest	9,913	
Other accrued accounts	5,713	6,602,147
Reserves — liability, etc.		19,905
Sub. co. common stk. —minority int.		157,100
United Motors cap. stk.—no par val.		40,234,800
Sub. co. capital surp. minority int.		318,134
Profit and loss surplus		7,304,223
Total		$56,339,609

*Value after $2,024,036 reserve for depreciation.

†Includes the normal Federal income tax of 2 per cent for the year ended June 30, 1917; no provision is made for the excess profit taxes.

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Fixing of Billet Prices Will Not Affect Automotive Industry

WASHINGTON, Oct. 23—The fixing of billet prices by the War Industries Board, together with the other steel products, according to Christian Girl, chairman of the Military Truck Production Board, will not have the slightest effect upon the automotive industry.

Mr. Girl explained this by suggesting that almost all of the automobile companies already have contracts running for long periods at prices which on the average are the same as that fixed by the Government on billets. Mr. Girl added:

"And for the same reason neither do I think this price fixing will have any effect on the alloy steels."

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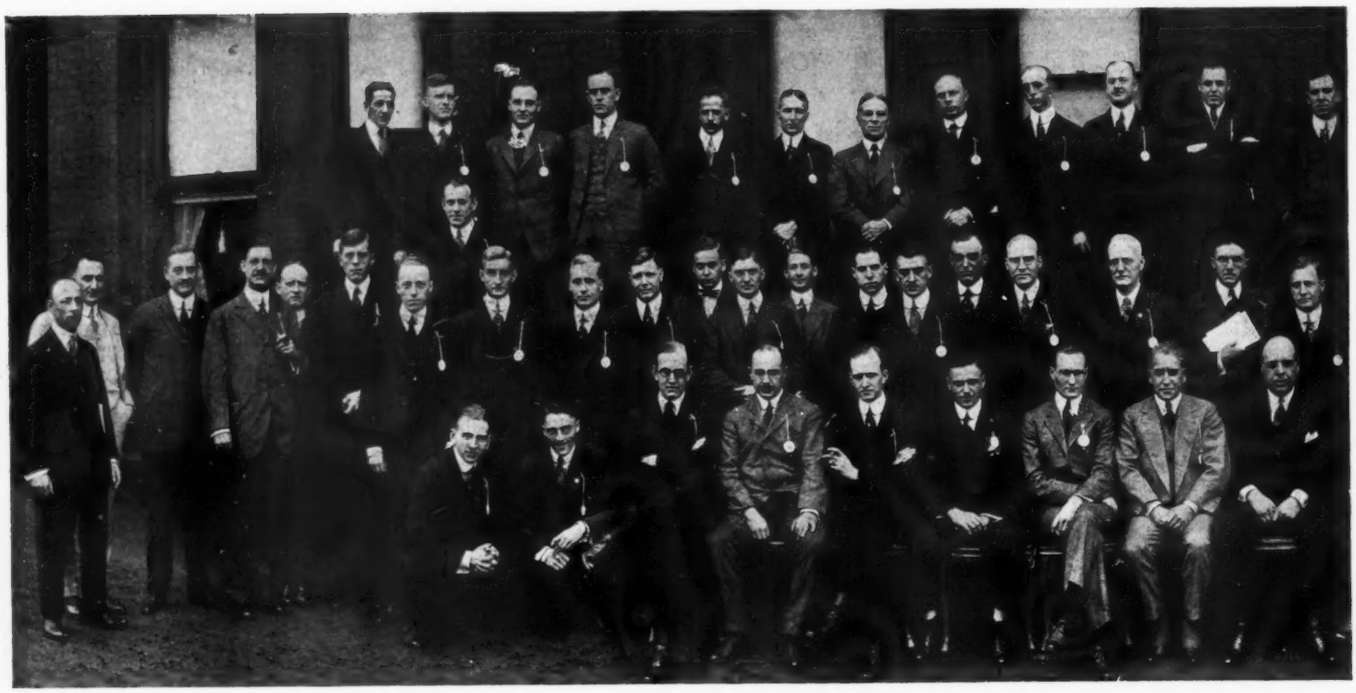
$640,485 Quarterly Profits for Stewart-Warner

CHICAGO, Oct. 22 — The Stewart-Warner Speedometer Co. reports for the quarter ended Sept. 30 net profits, after deducting 6 per cent income tax, not allowing war tax, of $640,485, and for the 9 months ended Sept. 30 $1,840,390.

Estimating the war tax at $190,000, the net profits for the period would be $1,650,000, as compared with $1,880,000 after allowing 2 per cent tax, but no war tax in the corresponding period of last year.



M. A. M. Launches Big Credit Movement

Holds Meeting in Cleveland to Give Impetus to Its Growing Work

CLEVELAND, Oct. 18—In order to give impetus to the rapidly growing work of its credit bureau, the Motor & Accessory Manufacturers, Inc., held a meeting in this city to-day of its credit managers; 135 men were present and a high degree of co-operative spirit was developed during the all-day session, which terminated with a banquet at the Hollenden this evening.

The Credit Bureau has been doing admirable work for some time and plans to extend its scope greatly. One essential, however, was a better acquaintance among the credit managers of members and their greater familiarity with what the bureau has done, can do and proposes to accomplish.

C. W. Stiger, the president, was unable to be present because of war work in Washington. E. H. Broadwell, second vice-president, presided.

Among others present were L. D. Lyons, credit manager of the Westinghouse Electric & Mfg. Co.; J. M. McComb, assistant treasurer, Crucible Steel Co. of America; H. H. Merrick, credit manager, Armour Curled Hair Works; Roy D. Chapin, Hudson Motor Car Co.; R. M. McConnell, credit manager, Firestone Tire & Rubber Co.; M. A. Monyihan, Gemmer Mfg. Co.; S. R. Wilhelmy, Standard Parts Co.; R. D. Mock, Hydraulic Pressed Steel Co.; J. V. Higginbotham, Detroit Lubricator Co.; A. C. Bagley, credit manager, M. A. M.

Other meetings are to be held in different cities to further the work. In Cleveland the members were the guests at a buffet luncheon and the banquet of the Cleveland members.

Merrick talked on business conditions of to-morrow and went rather deeply into an analysis of what the M. A. M. members may expect in the future.

The convention extended a resolution of thanks to President C. W. Stiger and Christian Girl for the service they are rendering the government in Washington. Stiger is on the Automotive Transport Committee of the Council of National Defense. Girl is in charge of truck production.

The convention was in charge of the credit committee, consisting of F. R. Wilhelmy, assistant treasurer of the Standard Parts Co.; R. D. Mock, Hydraulic Pressed Steel Co.; P. A. Connolly, financial director of the Standard Parts Co., and G. H. Johnstone, Armour Curled Hair Works; M. C. Dittmann, vice-president and treasurer of the American Bronze Corp.; M. A. Monyihan, treasurer of the Gemmer Mfg. Co.; R. M. McConnell, credit manager of the Firestone Tire & Rubber Co.

M. A. M. Show Dinner to Be Serious

CLEVELAND, Oct. 19—The Board of Directors of the Motor & Accessory Manufacturers, Inc., held a meeting to-day following its credit managers' meeting yesterday and took action on several important matters.

Show Dinner More Serious

It voted to hold its annual New York show banquet as usual, January 9 at the Waldorf-Astoria, but voted to tone the banquet down, to bar all drinks from the banquet tables, whether purchased by guests or others, to eliminate the cabaret performance and to have addresses by two speakers of national prominence. The banquet committee consists of William M. Swett, E. H. Broadwell, Thomas J. Wetzel, James H. Foster, Christian Girl and Charles E. Thompson.

Show to Be Best Ever

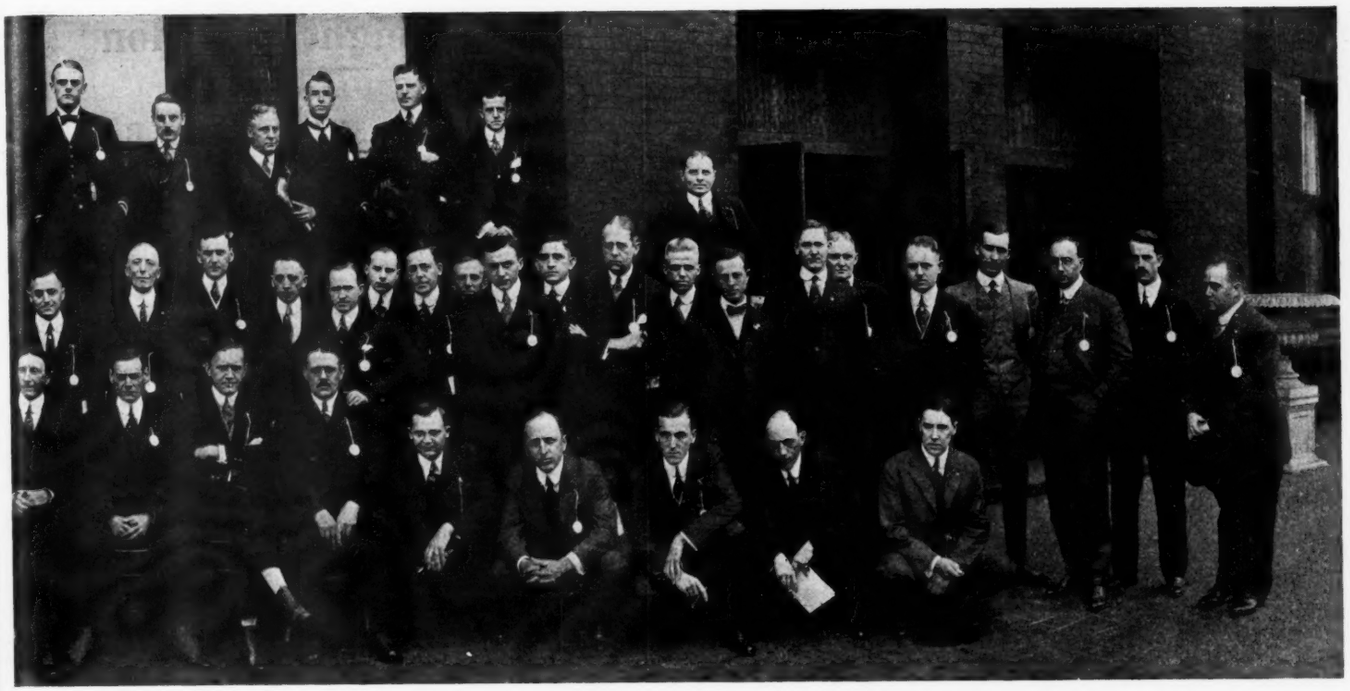
Manager L. M. Bradley's report on the sale of show space was that this year's initial purchase is the largest ever made in the history of the shows and that apparently the New York and Chicago shows will be the most successful ever held.

Dispose of Bogus Parts Question

The bogus parts question had been disposed of, but not what might be called settled. Attorney Sidney S. Meyers gave an opinion to the effect that the Morrison Bill and the bogus parts question are outside the jurisdiction of the M. A. M. and that any dispute on the subject must be settled by the individuals concerned.

Puzzled Over Food Bill

Members of the M. A. M. are in a quandary as to what action to take in war work in view of an opinion by Attorney Meyers on section 3 of the Food Bill. According to his interpretation, this provides that a fine of $10,000 and a prison sentence of 5 years may be imposed upon



Who They Are : *The front-row man at the right on the left-hand page is E. H. Broadwell, 2d vice-president of the association and vice-president of the Fisk Rubber Co. He presided. Treasurer L. M. Wainwright of the M. A. M. sits in the front row at the left side of the right-hand page. Next to him is Manager L. M. Bradley. On Bradley's left is F. R. Wilhelmy, chairman of the Credit Committee. Back of Wilhelmy is Credit Manager A. C. Bagley of the M. A. M.*

any man who, as a member of any war committee or other government unit, recommends the purchase of goods made by a company in which he has even so much as a small stockholder's interest. The penalty also attaches if he assists in the making of such purchase no matter if it is not upon his recommendation.

This, for example, means that if the committee of which Christian Girl is a member wished to buy any springs of his company it would be very embarrassing for Mr. Girl and would be practically impossible for him to exclude himself from the jurisdiction of the statute, so that no matter how high his motives or how necessary his springs might be, he would be a criminal in the eyes of the law.

It was voted to invest $25,000 in the Second Liberty Loan.

To Fix Dixie Highway

That manufacturers are thinking seriously of delivering cars to dealers over the highways was inferred from the request by Roy D. Chapin, chairman of the Good Roads Committee of the N. A. C. C. that he be permitted to solicit support from M. A. M. members for improving a bad section of the Dixie Highway in Kentucky. When improved this will permit drive-aways into the South. Chapin's request was granted. The N. A. C. C. is backing the same movement.

Show Week Program

The M. A. M.'s New York show week program follows:

Wed., Jan. 9, 9.30 A. M., at association offices, 33 West Forty-second Street, meeting of executive committee followed by meeting of banquet committee.

10 A. M.—Finance Committee.

11 A. M.—Board of Directors.

3 P. M.—Waldorf Astoria, 14th annual meeting.

7.30 P. M.—10th annual banquet.

Thursday, Jan. 10, 2.30 P. M., association offices, West Forty-second Street, meeting of Board of Directors and election of officers.

New Members

The following new members were elected. Menominee Electric Products, Inc., New York, generators, starters and electrical apparatus; G. L. W. Spring Oiler Co., San Diego, Cal., spring oilers; Central Steel Co., Massillon, Ohio, Agathon steel; Kales Stamping Co., Detroit, pressed steel parts. This makes a total of 282 members, the largest in the history of the association. The following names have been changed: American Bronze Co., Berwyn, Pa. to American Bronze Corp.; Wagner Specialty Co., New York, to Gibralter Jack Co.

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Denver Plans Automobile Convention

DENVER, COL., Oct. 19—Plans are under way for a convention of all men interested in the automobile industry in in its various branches, to be held in Denver during the automobile show, Nov. 12 to 18. Railroads have all agreed upon reduced rates on the certificate plan for the week of the convention. Aside from the formation of a Middle West Assn., the program contemplates instructive talks by men prominent in the State in large industries which have a bearing on the automobile business. The convention will be held during the mornings of the 12th, 13th and 14th.

Some of the subjects to be taken up after organizing are: Good Roads, Credits and Collections, Statistics, Legislation, Reciprocity, Construction Work to Enlarge the Trade Area of This Section, Efficiency in Operation and Records and the Used-Car Problem.

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The Cost of Producing American Glass

WASHINGTON, Oct. 18—The Department of Commerce has completed a report on the cost of producing glass in this country and wishes to place a copy of it in the hands of every person directly or indirectly interested in that industry. An introduction gives a history of the industry and shows its present importance, as well as tracing the effects of the war. Then there are chapters on materials, machinery and processes; capital, net sales and turnover; depreciation of plant and equipment; cost and profits by establishments; cost and profits by specified units; industrial conditions; selling expense; wages and labor conditions; needs of the industry; imports and the tariff; products exported, and opportunities in the export trade. There is also an eighteen page bibliography of the glass industry. The report contains 430 pages but may be obtained at the nominal price of 35 cents from the Superintendent of Documents, Washington, D. C.

Automotive Issues Weak

Packard and Miller Rubber Show Big Declines As Result of Forced Sale of Stock

NEW YORK, Oct. 23—With the exception of a few issues, demand for automotive and allied stocks showed a decided weakness last week. The Liberty Loan has been responsible for considerable unloading of stock, particularly from the West. Miller Rubber and Packard were particularly affected by this forced liquidation. The drop of 34 points in Packard, which is an inactive stock, was caused by a forced sale of 100 shares from the West.

Automobile and allied stocks are selling far below their true value, and it is the consensus of opinion in Wall Street that automobile stocks will find their proper level as soon as buyers show more confidence in the issues. At present prices are governed by the whims of the buying public and the bears, who have forced them down below their true worth.

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Elgin Assets Increased 38.5 Per Cent

CHICAGO, Oct. 23—The Elgin Motor Car Corp., in its statement for the half year ending July 31, 1917, shows an increase in its total assets from $2,123,397.86 to $2,941,454.83, an increase of 38.5 per cent. During the same period its cash on hand and in banks increased from $168,679 to $321,859, an increase of 90 per cent. Parts and material likewise increased from $542,248 to $838,003, an increase of 54.5 per cent.

Balance sheet of the Elgin Motor Car Corp. at the close of business, July 31, 1917:

ASSETS

Cash on hand and in banks	$321,859.98
Accts., notes and bills receivable	461,096.78
Parts, material and advances paid on material	838,003.16
Prepa d rent and insurance	1,013 30
Miscellaneous prepaid items	28,262.85
Real estate and buildings	160,774.53
Machinery and equipment	36 144.66
Furniture and fixtures	10,599 91
Used cars	3,865.88
Cost of motor design and sample motors	13,156.63
Good will, etc	400,000.00
Car designs, trade name, patterns, etc	203,919.05
Commission, discount and stock sales expense	230,019.87
Stock in other companies	45,748.30
Deferred charges to operations	186,989.93
	$2,941,454.83

LIABILITIES

Current accounts payable	$133,986.40
Deposits from dealers on motor car contracts	38,739.40
Accrued payroll	113.31
Bonds and accrued interest	66 080.00
Deferred payments on land	28,465.00
Capital stock issued and outstanding	2,572.394.00
Contingent funds	101,676.72
	$2,941,454.83

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Studebaker Debt Reduced to $9,000,000

NEW YORK, Oct. 23—The financial condition of the Studebaker Corp. shows improvement. Its floating debt stands at about $9,000,000. This figure compares with total bank loans of $13,231,520 as of July 1, a condition which was an important factor in the reduction of the dividend from a 10 per cent per annum basis to 4 per cent in August. By the end of this year the loans will be down to about $5,000,000, according to present plans of the management. The company is expected to earn about $5,500,000 this year, or 16 per cent on the common stock.

Freight Situation Acute

Priority of Government Business Increases Shipping Difficulties

DETROIT, Oct. 22—The car shortage situation here at present is very acute and there is an insufficient supply of cars on hand at present to care for the necessary shipments. Orders have recently been issued by the Car Service Commission at Washington specifying that all automobile cars shall be returned either loaded or empty to or in the direction of the home road.

In many quarters heavy demands have been made for cars, particularly in the East, and the lake routes are at present offering an outlet for shipments in this direction. The Detroit River front is packed with outgoing cars, and it is possible that the service will be increased from time to time to accommodate the manufacturers desiring to take advantage of the water route.

Several other problems are confronting the manufacturers of automobiles. Large demands on the steel and aluminum market caused by the war orders render the procuring of materials difficult, and the condition of the labor market for the same reasons predicts a labor shortage. This condition has not become marked at present, but doubtless will be felt by the first of the year.

The war order situation has tended to increase the shipping difficulties, as war orders being filled here must be transported to the seaboard, and Government business is naturally given preference.

Automotive Securities Quotations on the New York and Detroit Exchanges

	Bid	Asked	Net Ch'ge
*Ajax Rubber Co.	57	62	+3
*J. I. Case T. M. Co. pfd.	..	81	..
Chalmers Motor Co. com.	2½	6	+ ½
Chalmers Motor Co. pfd.	..	..	..
*Chandler Motor Co.	72	74	..
Chevrolet Motor Co.	78	80	+8
Curtiss Aeroplane	33	34	—2
*Fisher Body Corp. com.	25	35	..
*Fisher Body Corp. pfd.	81	84	—1
Fisk Rubber Co. com.	50	60	..
Fisk Rubber Co. 1st pfd.	100	105	..
Fisk Rubber Co. 2nd pfd.	85	95	..
Firestone Tire & Rubber Co. com.	98	101	—9
Firestone Tire & Rubber Co. pfd.	99	101	—1
*General Motors Co. com.	95¼	96¼	+3¼
*General Motors Co. pfd.	78½	79	+4⅝
*B. F. Goodrich Co. com.	42½	43	+1¼
*B. F. Goodrich Co. pfd.	100	103	..
Goodyear Tire & Rubber Co. com.	159	163	—11
Goodyear Tire & Rubber Co. pfd.	99	101	—1
Grant Motor Car Corp.	2	4	..
Hupp Motor Car Corp. com.	2½	3½	..
Hupp Motor Car Corp. pfd.	82	88	..
International Motor Co. com.	8	12	..
International Motor Co. 1st pfd.	..	50	..
International Motor Co. 2nd pfd.	15	30	..
*Kelly-Springfield Tire Co. com.	44⅛	44¾	+3⅝
*Kelly-Springfield Tire Co. 1st pfd.	85	90⅛	..
*Lee Rubber & Tire Corp.	15¼	16	—1¼
*Maxwell Motor Co., Inc. com.	32	32½	+ ¼
*Maxwell Motor Co., Inc. 1st pfd.	64½	66	+ ½
*Maxwell Motor Co., Inc., 2nd pfd.	17¾	19¾	+ ¾
Miller Rubber Co. com.	140	155	—25
Miller Rubber Co. pfd.	99	101	—1
Packard Motor Car Co. com.	109	117	—34
Packard Motor Car Co. pfd.	92	96	—2
Paige-Detroit Motor Car Co.	23	25	..
Peerless Truck & Motor Corp.	10	13	..
Portage Rubber Co. com.	116	123	—4
Regal Motor Car Co. pfd.	21	23	+6
Reo Motor Car Co.	21	23	—2
*Saxon Motor Car Corp.	8½	9½	—2½
Springfield Body Corp. com.	..	..	..
Springfield Body Corp. pfd.	..	..	..
Standard Motor Construction Co.	8	9	..
*Stewart-Warner Speed. Corp.	58	60	+2
*Studebaker Corp. com.	40	41	+ ½
*Studebaker Corp. pfd.	90	96	..
Submarine Boat	16¾	16¼	+1¼
Swinehard Tire & Rubber Co.	35	45	—5
United Motors Corp.	20½	21½	+ ¾
U. S. Aeroplane Corp.	4½	3½	..
*U. S. Rubber Co. com.	58½	60	+1⅝
*U. S. Rubber Co. pfd.	101	102	+3
*White Motor Co.	40	40¼	+ ½
*Willys-Overland Co. com.	23	23½	— ⅜
*Willys-Overland Co. pfd.	..	43	..
Wright-Martin Air Craft	9¾	8¾	+ ⅝

*At close October 22, 1917. Listed New York Stock Exchange.

OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE

ACTIVE STOCKS

	Bid	Asked	Net Ch'ge
Auto Body Co.	..	10	..
Bower Roller Bearing Co.	..	30½	..
Chevrolet Motor Co.	78	80	+5
Commerce Motor Car Co.	..	..	..
Continental Motor Co. com.	5¾	5⅞	+ ⅛
Continental Motor Co. pfd.	..	..	..
Edmunds & Jones com.	..	35	..
Ford Motor Co. of Canada	219	224	+4½
Hall Lamp Co.	..	19¼	..
Michigan Stamping Co. com.	12½	13⅛	..
Motor Products	..	..	..
Packard Motor Car Co. com.	100	115	..
Packard Motor Car Co. pfd.	..	96	..
Paige-Detroit Motor Car Co.	20	23	..
Prudden Wheel Co.	15	17	..
Reo Motor Car Co.	21	22½	..

INACTIVE STOCKS

Atlas Drop Forge	..	35½	..
Kelsey Wheel Co.	82	..	..
Regal Motor Car Co.	..	26½	..

To Manufacture Duplex Drive Truck and Tractor

EAU CLAIRE, WIS., Oct. 20—A duplex drive motor truck and tractor, designed by Jonas Bergh, Eau Claire, Wis., will be manufactured by the New Way Machinery Co. of that city, in addition to the Wege combination, truck, tractor and concrete mixer, now in production. The company recently was incorporated with $60,000 capital by Ernest Wege, Minneapolis, Minn., and has established a shop in Eau Claire.

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MILWAUKEE, WIS., Oct. 20 — The Seeger Mfg. Co., which some time ago established a plant at 1001 Thirtieth Street, Milwaukee, for the manufacture of a coal-burning heater for private or small garages, has incorporated its business under the same style under the laws of Illinois, with a capital stock of $7,400, all of which is represented by the works in Milwaukee. The main offices are at room 231, 175 West Jackson Boulevard, Chicago. The Seeger garage heater is made in two types, one listing at $45 and the other at $55. The device is self-regulating and automatically controlled at any desired temperature. A third type, for garages containing up to six cars, is now being added to the line. F. G. Hudson is secretary of the company.

New Companies Formed

Latest additions to ranks of Automotive Industries

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Big Copper Strike Settled

WASHINGTON, D. C., Oct. 23—Settlement of the strike in the Globe Miami copper district of Arizona, which has been on since July 2, has been officially announced by the Government. This is most important to the success of the war as the normal monthly output of the Globe Miami district is about twenty-one million pounds of copper.

Ajax Forge Co. Incorporates With $1,750,000 Capital

SUPERIOR, WIS., Oct. 20 — The new drop forge plant being completed at Superior, Wis., at a cost of $200,000, by interests identified with the Ajax Frog & Switch Co., Blue Island, Ill., has been incorporated separately under the style of Ajax Forge Co., with a capital stock of $1,750,000, in Delaware. The main offices will be in Chicago, in charge of William E. Crocombe, secretary. The Superior plant, which will go into operation about Nov. 1, is 120 by 200 ft. in size, equipped with new planers, drills, air hammers, bulldozers and other machinery and tools.

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MILWAUKEE, WIS., Oct. 20 — The Northwestern Pattern Works, Milwaukee, operating a general wood and metal pattern shop for gas engine and other manufacturers, has incorporated its business under the same style, with a capital stock of $2,500. The corporators are Rudolph, Henrietta and Bertha Mueller.

Making Testing Accurate

(*Concluded from page 723*)

The test is divided as follows: Analysis of pump capacity and solidity of flow at all speeds; comparison of radiator flow to take care of maximum pump speed. If the radiator will not flow the requisite number of gallons, of course the water piles up at radiator inlet and in time overflows. This rapidly empties the system with boiling as a result. With proper capacity of radiator to handle the flow the baffle in the inlet must be studied to deflect the inrushing water to the sides of the tubes. Good distribution over the top area of the radiator will minimize this loss and render the full frontal area of cooling surface effective.

Fan circulation and effectiveness must also be checked. These comprise tests of fan in free air and also with standard car installation. The volume of air passing through radiator at the critical speed may be easily determined by driving the fan from a variable speed electric motor, cutting a small space in the hood for the belt to pass through and coupling the front of the radiator shell to a flexible boot which makes a tight connection with an air measuring tube at the front of the car. Advantage of increased louvres and free space about motor using a constant fan speed can be determined. Consideration must also be given to the added amount of air which the velocity of the moving car will require, independent of the fan.

Motor influences require a separate analysis of conditions from the carbureter to the water spaces about the cylinders. Improper shunting of the water will produce eddies and ineffectiveness of the weight of water used. Too much water may be circulated at a point not requiring cooling and vice versa. Foundry difficulties must be eliminated by proper design, for this is a trouble which is not evident from the outside and requires sectioning of the particular cylinder for its determination. Water should be circulated at a rate to correspond with car speeds and its flow studied for improvements.

With the introduction of the highly developed present-day motor we have found changes necessary in many details. One of the developments has been in spark plugs, their proper heat dissipating ability and location. The method of testing plugs and finding the one best suited deserves mention.

About the first item to be observed in testing porcelain spark plugs is breakage. Porcelain is broken by sudden changes from heat to cold, especially in high-speed motors. After the electrodes have been adjusted and the plugs installed in the motor which is connected to a dynamometer, the load and speed being previously adjusted for the motor at its maximum horsepower, with water at room temperaure or less, the motor is then started and the throttle quickly thrown wide open to let the motor reach its maximum speed. After about one minute of high speed the ignition switch is pulled, and while the motor is slowing down it should be noted if any preignition occurs.

If upon examination porcelains are not cracked, another run may be made at maximum torque with the motor cold.

After these two runs the heat test may be given. The temperature of the water should be brought close to the boiling point and tests made at a low speed, wide open throttle, at maximum torque and at the highest speed of the motor.

During these tests leakage may be observed at the top and around the base of the porcelains. The top and the base of the porcelains may be given an oil bath to show up compression or explosion leaks. Usually porcelains are cracked during these tests. A cracked porcelain may be instantly recognized if the spark is retarded just enough to stop spark knocks; the cracked or broken porcelain will immediately cause preignition.

If on previous tests the porcelains withstand the hard abuse, tests may be made as follows: The motor may be started and given full load at low speed; the outlet water should be about room temperature at start and gradually increased with sufficient spark advance for the best pull of the motor. Tests should be made for at least five minutes' duration, during which time one must be on the alert for knocks. If the motor gives spark knocks the spark may be retarded a trifle; if knocking does not cease, the ignition switch may be pulled with the throttle wide open and observe whether the motor still fires with an open switch; if it does the firing is generally accompanied by sharp, hard knocks, and the motor will run for some time, firing occasionally, which, as you all know, is bad preignition.

Such a subject as motor testing cannot be covered in one paper. If in touching upon the above examples which represent characteristic problems, we have added something to the proper manipulation of the laboratory, it is all that can be hoped for. We are continually discovering details which if discussed and practised will help materially to accelerate the activities of the industry.

Bacon Supervises Manufacture of Guns for Government

MILWAUKEE, WIS., Oct. 20—Frank R. Bacon, president of the Cutler-Hammer Mfg. Co., manufacturing electric controlling devices, magnetic gearshifts, etc., has been promoted from captain to major in the United States Reserve (Industrial) and detailed to have general supervision over the execution of Government contracts for the manufacture of machine guns at New Haven, Conn. The work will require his entire time and Major Bacon therefore has temporarily relinquished active connection with the Milwaukee concern.

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John T. Boone, formerly chief engineer and factory manager of the Disco Electric Starter Corp., has opened an office at Detroit as consulting and designing engineer. Gerald H. Allen, engineer and factory manager of the Detroit Starter Co., is associated with him, but will not take an active part in the work, retaining his present position.

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August C. Fruehauf has become general manager, H. C. Fruehauf, assistant, H. G. Brown, sales manager and E. L. Vosler, auditor of the Fruehauf Trailer Co., Detroit. Brown was formerly with the Ford Motor Co., and Vosler with the Aluminum Castings Co. In the past 6 months, the trailer business has increased about 50 per cent, mostly in trailers of the heavy duty type. A capitalization change has been made from $75,000 to $100,000 and a new factory is under consideration. Two other trailer companies have been absorbed; the Michigan Auto Trailer Co., and the J. M. Semi-Trailer Co., both of Detroit, and both manufacturing light semi-trailers for Fords.

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C. L. Laine has been commissioned captain in the motor equipment section, ordnance department, U. S. R. Mr. Laine formerly was sales agent for automobile equipment at Indianapolis, Ind.

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George L. Brush, Canadian manager for the Harroun Motor Corp., has resigned to join the Elgin Motor Car Corp. of Canada.

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Louis M. Baker is sales manager of the United Motors Service, Inc., Detroit, official service representative of the Delco, Klaxon and Remy electrical companies, with headquarters at 3066 West Grand Boulevard. Baker was formerly western representative in Detroit for the Standard Steel Spring Co. of Coraopolis, Pa.

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P. R. Finch is district representative of the United States Motor Truck Co. and will doubtless be assigned to the Chicago territory.

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Frank W. Pilling is district manager of the Hupp Motor Car Co. for the Detroit and Middle West territory. Pilling has been selling automobiles for fourteen years having been assistant sales manager for the K-R-I-T Motor Car Co. and was most recently district supervisor for the Liberty Motor Car Co. in the East.

Men of the Industry

Changes in Personnel and Position

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C. S. Crawford, is director of purchases for the Holley Bros. Co. having resigned from the Kelsey Wheel Co.

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William Hickox has been appointed eastern district sales manager for the Cole Motor Car Co. His headquarters will be in the U. S. Rubber Building, New York.

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G. E. McLaughlan, who for the past 16 years has been connected with the Pere Marquette Railroad at Toledo, has been appointed traffic manager of the Dort Motor Car Co., Flint, Mich.

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R. M. Thompson, formerly with the Schillo Motor Sales Co., Chicago, left Oct. 15 for Toronto, Canada, to join the Royal Flying Corps.

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George C. Conn, formerly traffic manager of the Pere Marquette, has been appointed traffic manager of the Buick Motor Co.

Mr. McClough, formerly traffic manager, has been appointed assistant to the president in charge of traffic.

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Chas. H. Gresslee and E. L. LeBlond have joined the Selden Truck Sales Co., Rochester, N. Y. Mr. Gresslee will establish division headquarters at Cincinnati, covering southern Ohio, Indiana, Kentucky and West Virginia. Mr. LeBlond's headquarters will be at Kansas City, Mo., covering Missouri, Kansas, Nebraska and part of Iowa.

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George R. Cullen has resigned as editor of the *Chalmers Monogram* and the *Chalmers Illustrated News* and has made no announcement of his future connection. Mr. Cullen was formerly publicity manager of the Hudson Motor Car Co. and editor of the *Hudson Triangle*.

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F. A. Law of Hartford, Conn., who recently severed his connection with the Eastern Motors, Inc., New Britain, Conn., as chief engineer and designer, has joined the Hartford Buick Co., Hartford, Conn., to take charge of the Owen Magnetic and Baker Electric department.

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Lloyd P. Jones, former sales manager of the Federal Brass Works, has been appointed vice-president and general manager of that company.

Agnew Joins Cleveland Hudson Distributor

CLEVELAND, Oct. 23—W. L. Agnew, formerly director of advertising and publicity for the Chalmers Motor Co., is vice-president and general manager of the F. E. Stuyvesant Motor Co., Hudson distrbutor. Agnew was advertising manager for the Hudson Motor Co. for 4 years before his term as director of advertising for the Chalmers company and resigned from the latter company when it was taken over by the Maxwell Motor Co.

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J. R. Van Cleve is in charge of the service department of the Dort Motor Car Co., Flint, Mich.

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Fred C. Gumper, purchasing agent of the Ross Automobile Co., Detroit, has resigned and has made no announcement of his future connections. He was formerly connected with the F. B. Stearns Co. of Cleveland, with the Weston-Mott Co. at Flint, and with the Ford Motor Co.

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ELECTIONS

GREEN BAY, WIS., Oct. 20—The Crank Shaft Valve Movement Corp., Green Bay, Wis., incorporated recently with $300,000 capital stock to build a new type of gearless motor, has perfected its organization by the election of Jules Gerard, inventor and designer of the motor, as president. Other officers are: Vice-president, Sylvester Duquaine; treasurer, A. L. Cannard; secretary, William Cook; general manager, W. V. Leppla. An experimental shop has been opened and later a small factory will be established in Green Bay, pending the introduction of the engine among passenger and commercial car, truck, tractor and aircraft manufacturers. Only a limited amount of capital stock is being offered for sale.

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Supreme Motor Factory for Fort Wayne to Build a Twin Six

FORT WAYNE, IND., Oct. 20—The Supreme Motor Corp. will locate its plant in Fort Wayne, according to plans now under way. Work will be started on new factory buildings within a year.

The Supreme Company has taken over all experimental work that has been in the hands of the Davies-Mitchell company of Cleveland, this part of the work now being complete and the motors put through various tests.

A twin-six motor has been developed and experimental work is now complete. For the present it will not be manufactured, but it will be shown in this city soon. It will also manufacture a four and a six. All motors are of L-head type, the head being detachable. Special features are the counterbalanced crankshaft and forced feed lubrication.

The company plans to bring out within a short time a four-cylinder car, manufactured and assembled in this city.

Lincoln Factory Being Rushed to Completion

DETROIT, Oct. 22—Work on the new factory of the Lincoln Motor Co. is being rushed to completion. On the longest building the concrete foundations, brick walls and framework have been completed, and the work is progressing on each of the other eight structures. The entire site comprises about 50 acres of land, and 1800 laborers and 5 steam shovels are at work. It is expected that two of the largest structures will be roofed over by the end of this month and the installation of equipment started.

The company is headed by the Lelands, father and son, who were formerly managing directors of the Cadillac Motor Car Co., and will manufacture airplane engines.

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Comet Building Plans Completed

DECATUR, ILL., Oct. 23—The contract for the construction of the Comet Automobile Co. plant has been let for $87,752, exclusive of the concrete floor and foundations. The contract calls for the completion of the first unit by March 1. It is planned to employ 600 men at the outset and increase this number as business conditions warrant. Other buildings of smaller size will be erected from time to time.

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Waukesha Motor Working on Government Contracts

WAUKESHA, WIS., Oct. 20—The Waukesha Motor Co., Waukesha, Wis., which increased its capacity about 50 per cent during the last six months, has been obliged to enlarge its facilities about 50 per cent more in order to handle large Government contracts for motors and parts. Shop No. 1 will be enlarged by a one-story brick and steel addition, 100 by 225 ft., and shop No. 2 will be enlarged 90 by 180 ft. Contracts specify completion by Dec. 1.

The Waukesha company has a contract for 2500 Liberty motors for the new Class B military truck for delivery with spare parts within six months' time.

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Trublepruf Tire for Peoria

PEORIA, ILL., Oct. 22—The Lambert Multiplus Co., manufacturer of Trublepruf tires, will erect a factory at East Peoria, a tract of 40 acres of land being donated by citizens. H. M. Lambert is president of the company and inventor of the tire. The tire is a substitute for the pneumatic and will be manufactured upon an extensive scale. Plans for buildings are now being prepared.

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Wisconsin Duplex Plans for Future

CLINTONVILLE, WIS., Oct. 20 — The Wisconsin Duplex Auto Co., Clintonville, organized early this year with $500,000 capital to build a passenger and commercial car employing a duplex transmission system designed by William A. Besserdich, who collaborated with F. A. Zachow in the manufacture of the first types of the present four wheel drive truck, will hold its first annual meeting on Oct. 23 and take definite action on its plans for the future. A number of cars have been built under the personal direction of Mr. Besserdich at the plant of the Andrews Motor Manufacturing Co., 834 Muskego Avenue, Milwaukee. This plant either will be taken over or production undertaken in it on a commercial basis until the company erects a plant of its own. It is hoped that the first cars will be ready for the market by Nov. 15 or Dec. 1. The Wisconsin Duplex will employ a 30 hp. Le Roi motor and the Bailey differential. Negotiations are being closed for a distributing organization with a concern having headquarters in New York.

Current News of Factories

Notes of New Plants—Old Ones Enlarged

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A. O. Smith Adds

MILWAUKEE, WIS., Oct. 20—The A. O. Smith Corp., Milwaukee, manufacturer of pressed steel frames, trucks and automobile parts, is erecting a new office building, two stories high, 40 by 80 ft., costing $15,000, as an addition to its present offices.

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Appleton Body's New Plant

APPLETON, WIS., Oct. 20 — Work is now well under way on the new manufacturing plant of the Appleton Auto Body Co. It will be 50 by 237 and 40 by 50 ft., L shaped, of concrete and brick, and cost about $25,000 with equipment.

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Johnson Gives Insurance to Employees

RACINE, WIS., Oct. 20—S. C. Johnson & Son, Racine, Wis., manufacturers of a variety of waxes, finishes, carbon remover and other preparations for the motor car accessory trade, has presented to each of its several hundred employees a free insurance policy under the group plan recently adopted by the leading manufacturers of the country.

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Superior Tire to Erect New Factory

INDIANAPOLIS, Oct. 20—The Superior Tire Co., Anderson, will within the next thirty days break ground for the erection of a new factory. The company, which is capitalized at $750,000, will erect a two-story concrete structure with a floor space of 50,000 sq. ft. The plant will have a capacity of 500 tires daily, but only 300 tires will be manufactured daily at the start. The president of the company is O. Hibner, a former sales manager of the Knight Tire & Rubber Co., Canton, Ohio. The consulting engineer is Charles A. BeSaw, president of the BeSaw Tire & Rubber Co.

King Trailer Co. Starts Production—35 a Day

ANN ARBOR, MICH., Oct. 22—The King Trailer Co. is now manufacturing trailers in its new plant, and is averaging about 35 per day. This plant is 160 by 60 ft., cost $20,000, is of daylight construction, and said to be the second largest trailer plant in the country. About 50 men are employed in making trailers exclusively of the 2-wheel heavy duty type, and this may be increased to care for increased production within the next month. A short time ago the capitalization was increased from $50,000 to $150,000, of which $90,000 was paid in.

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International Motor Insures Employees

ALLENTOWN, PA., Oct. 19—The International Motor Co. has put into action a plan for insuring its employees. This plan includes all employees who have been in its service for more than 3 months. The entire cost to the company approximates $1,500,000 and affects 2200 individuals.

The amount of each employee's insurance is governed by the length of time that he has been in the service of the company. Employees for more than 3 months and less than a year are awarded a certificate for $750; those in service more than 2 years $1,000; those more than 2 years and less than 3, $1,100; more than 3 and less than 4 years, $1,200; more than 4 and less than 5 years, $1,300; those more than 5 and less than 6, $1,400; and more than 6 years, $1,500.

This new system has no relation to the insurance devised by the State Compensation Acts, and the amount of the insurance stated on the certificates is in addition to any compensation to which employees are entitled under the present State Acts.

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Power Plant for Maccar

SCRANTON, PA., Oct. 19—A one-story power plant, about 30 by 42 ft., to cost $10,000, will be erected by the Maccar Truck Co., Scranton, at its new plant now in course of construction.

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Olds Building Under Way

LANSING, MICH., Oct. 17—The two new factory buildings of the Olds Motor Works are well under way and will be in use about Jan. 1. One is a three-story structure 80 by 400 ft. that will be used for new material storage. The other is a three-story building 80 by 400 ft. and having a 90 foot L. This building will be used for final assembly and painting. The steel work is all up on the first building and on the second the concrete work has been completed.

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Wolverine Speedway Special on Exhibition

KALAMAZOO, MICH., Oct. 19—The Wolverine Motor Car Co. has increased its capitalization to $250,000. The first models of the Wolverine Speedway Special are now being exhibited. This car

has a wheelbase of 117 in., and it is stated, is capable of developing a speed of 100 m.p.h. Aluminum enters largely into the construction. It is planned to start active production in November and material is on hand for manufacturing 600 cars during the coming year.

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Harroun Offices Moved to Plant

WAYNE, MICH., Oct. 19—The General offices of the Harroun Motor Corp. have been moved from the Dodge Power building in Detroit to the Wayne factory.

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Republic Truck Building Nearly Completed

ALMA, MICH., Oct. 17—The new building of the Republic Motor Truck Co. will soon be completed and the motor and transmission assembling will be transferred to it. This building is 240 by 112 ft. and will contain a blacksmith shop in addition to the above departments. Several other changes are under way. The yards are being paved with concrete, new turntables are being installed, and an experimental testing room with dynamometer, etc., is being fitted up.

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Hayes Axle Not for Grand Rapids

GRAND RAPIDS, MICH., Oct. 17—Though no definite plans are available, it has been announced that the Hayes Axle Co., of Oshkosh, Wis., will not locate in Grand Rapids as planned. It is understood that arrangements have been made elsewhere for refinancing and enlarging the concern.

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Elgin Output to Be Doubled

CHICAGO, Oct. 20—Excavations have been made on the new factory buildings of the Elgin Motor Car Corp., and construction work is now under way. The first of the plants will be ready in less than 30 days, and the new factory building will be completed in 3 months. It is stated that the present output of forty cars per day will be doubled for the next season, and that during the past year, sales and production have increased 1074 per cent; factory space has increased 1249 per cent, and assets have been affected 2000 per cent.

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Columbia Truck Adds Assembly Plant

PONTIAC, MICH., Oct. 22—The Columbia Motor Truck & Trailer Co. is now completing an assembly plant 90 by 300 ft. This is equipped to handle assembling in a progressive manner and will greatly increase the output of the factory. Preparations are being made to fill a foreign order for the 2-ton models. It is said that the order amounts to $975,000 and is to be completed within 3 years.

Calendar

ASSOCIATIONS

1918

Jan. 3-4—New York, Automotive Electric Assn. meeting.

CONTESTS

Oct. 27—New York Speedway Race.

SHOWS

Oct. 13-28—Dallas, Tex., Dallas Automobile & Accessory Dealers' Assn., State Fair.
Oct. 22-27—Worcester, Mass., Casino & Bancroft Hotel, E. H. Winchell, Publicity Mgr.
Nov. 12-17—Los Angeles, Cal., Motor Car Dealers Assn., Billy Sunday Tabernacle.
Nov. 12-18—Denver, Col., Automobile Trades Assn., Show Committee, Auditorium. G. A. Wahlgreen, Mgr.
Dec. 3-8—Akron, O., Akron Auto Show Assn., Auditorium Armory. O. G. Armstrong, Mgr.

1918

January — Kalamazoo, Mich., Kalamazoo Automobile Dealers' Assn., Armory.
Jan. 2-9—New York, Salon, Automobile Salon, Inc., Astor Ballroom. John R. Eustis, Mgr.
Jan. 5-12 — New York Show, Grand Central Palace, National Automobile Chamber of Commerce.
Jan. 11-19—Philadelphia, 17th Annual Show, Philadelphia Auto Trade Assn., Commercial Museum Bldg.
Jan. 11-19—Providence, R. I., R. I. Licensed Auto. Dealers' Assn., State Armory. Percival S. Clark, Mgr.
Jan. 19-26 — New York Motor Boat Show, Grand Central Palace, National Assn. of Engine and Boat Manufacturers.
Jan. 19-27—Cleveland, Seventeenth Annual, Cleveland Automobile Show Co., Wigmore Coliseum. Fred. H. Caley, Mgr.
Jan. 19-28—Montreal, Can., Montreal Automobile Trade Assn., Ltd., Almy Bldg. T. C. Kirby, Mgr.
Jan. 21-26—Manchester, N. H., Academy. Couture Bros.
Jan. 21-26—Scranton, Pa., Scranton Motor Trades Assn., Armory. Hugh B. Andrews, Mgr.
Jan. 23-28—Allentown, Pa., Lehigh Auto. Trade Assn., Traylor Motor Co.'s Garage. P. W. Leisering, Publicity Mgr.
Jan. 26-Feb. 2—Chicago National Show, Coliseum and Armory. National Automobile Chamber of Commerce.
Jan. 26-Feb. 2—Chicago, Salon, Elizabeth Room of Congress Hotel.
February—Peoria, Ill., Peoria Auto and Accessories Dealers' Assn. W. O. Ireland, Mgr.
Feb. 11-16—St. Louis, Mo., St. Louis Auto Mfrs. & Dealers Assn., Robert E. Lee, Mgr.
Feb. 11-16—Kansas City, Mo., Third Annual National Tractor Show.
Feb. 16-23—New York, Second Pan-American Aeronautic Exposition, Grand Central Palace and Madison Square Garden.
Feb. 18-23—Grand Rapids, Mich., Automobile Business Assn., Klingman Building. Ernest T. Conlon, Mgr.
Feb. 18-23—Newark, N. J., N. J. Auto Exhibition, Co. G. First Regiment Armory. Claude E. Holgate, Mgr.
Feb. 18-23—Des Moines, Ia., Des Moines Automobile Dealers' Assn., Coliseum. C. G. Van Vliet & Dean Schooler, Mgrs.
Feb. 18-23 — Springfield, Ohio, Springfield Auto Trades Assn., Memorial Hall. C. S. Burke, Mgr.
Feb. 18-23—Waterbury, Conn., United Shows Co.
Feb. 16-24—San Francisco, Cal., San Francisco Dealers' Assn., Exposition Auditorium. G. A. Wahlgreen, Mgr.
Feb. 18-25 — Pittsfield, Mass., State Guard, State Armory. James J. Callaghan, Mgr.
Feb. 18-27—So. Bethlehem, Pa., Fourth Annual (cars 18-23; trucks 25-27), Coliseum. J. L. Elliott, Mgr.
March — San Francisco, Cal. Motor Truck Dealers of San Francisco, Auditorium. Ivan R. Gates.
Mar. 19-24—Cedar Rapids, Ia., Cedar Rapids Auto Trade Assn., Auditorium.
Apr. 9-13—Stockton, Cal., San Joaquin Auto Trade Assn. Samuel S. Cohn, Mgr.
Sept. 23-28 — Chicago, National Accessory Show for Fords, Coliseum.

S. A. E. Section Meetings

Oct. 18—Metropolitan Section. Subject, "Aeronautics."
Oct. 18—Detroit Section. Subject, "Laboratory Tests."
Oct. 19 — Cleveland Section. Meeting.
Oct. 25—Pennsylvania Section. Subject, "Springs," by W. C. Keys.

Engineering

American Railway Master Mechanics' Assn.
American Institute of Electrical Engineers.
Master Builders' Assn.
American Society of Heating and Ventilating Engineers.
Association Iron and Steel Electrical Engineers.
Mining and Metallurgical Society of America.
Society of Automotive Engineers.
Illuminating Engineering Society.
National Electric Light Assn.
National Gas Engine Assn.
American Society for Testing Materials.
American Institute of Metals.
American Foundrymen's Assn.
Society Naval Architecture and Marine Engineers.

NOVEMBER

3—Assn. Iron & Steel Elec. Engrs. monthly meeting Phila. section.
8—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Penn. section at Phila.
9—Amer. Soc. Heat. & Vent. Engrs monthly meeting Ohio Section at Cleveland.
10—Assn. Iron & Steel Elec. Engrs. monthly meeting Cleveland section.
12—Amer. Soc. Heat. & Vent. Engrs monthly meeting Ill. section at Chicago.
12—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Mich. section at Detroit.
13—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Mass. section at Boston.
15—Mining & Met. Soc. Amer. section at Engrs. Club.
15-16—Soc. Naval Arch. & Marine Engrs. annual meeting.
17—Assn. Iron & Steel Elec. Engrs. monthly meeting Pittsburgh section.
19—Amer. Soc. Heat. & Vent. Engrs. monthly meeting New York section.

DECEMBER

1—Assn. Iron & Steel Elec. Engrs. monthly meeting Phila. section.
8—Assn. Iron & Steel Elec. Engrs. monthly meeting Cleveland section.
10—Amer. Soc. Heat. & Vent. Engrs monthly meeting Ill. section at Chicago.
11—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Mich. section at Detroit.
13—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Penn. section at Phila.
13—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Ohio section at Cleveland.
15—Assn. Iron & Steel Elec. Engrs. monthly meeting Pittsburgh section.
17—Amer. Soc. Heat. & Vent. Engrs. monthly meeting New York section.
20—Mining & Met. Soc. Amer. Monthly meeting New York section at Engrs. Club.